

# MODERN Machine Shop

April, 1940

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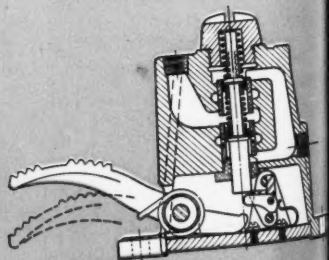
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# MODERN Machine Shop

HOWARD CAMPBELL, Editor

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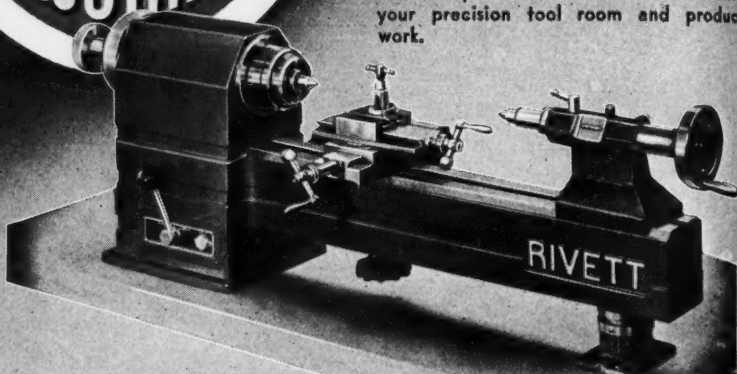
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### 918 BENCH LATHE

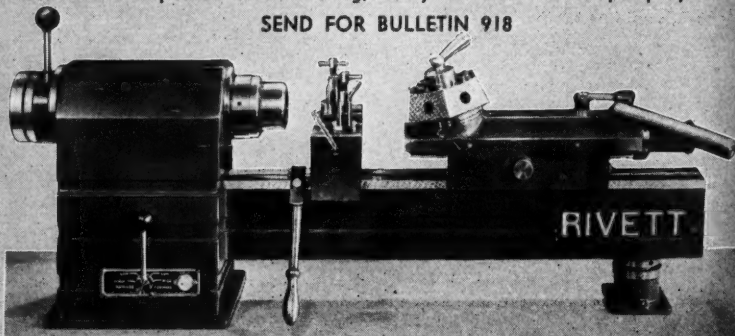
Bulletin 918 presents Rivett high precision, heavy duty bench lathe and hand screw machine. The balanced design, vibrationless performance, high spindle speeds and operating features place these machines in front for your precision tool room and production work.



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# MODERN Machine Shop

CINCINNATI, OHIO

APRIL, 1940

VOL. 12, No. 11

## We Present---

—the world's most up-to-date factory building, which has just been built by the General Motors Corporation for the production of aircraft engines. Built without windows, the nearest approximation to perfection in temperature, humidity, and light thus far available is achieved by the utilization of an eight-unit air conditioning plant and the most recent developments in lighting equipment.

—the second article of the series "Tool Steel for the Non-Metallurgist" by H. E. Replogle of the Crucible Steel Company of America, in which Mr. Replogle explains, in non-technical language, the difference in the various types of tool steels and tells what parts the carbon, molybdenum, tungsten, and other ingredients play in giving the steels the characteristics which make them peculiarly adapted for use in dies, cutting tools, and so on.

—the answers to your questions regarding soft and hard grinding wheels, grinding wheel speeds, and the other factors involved in production grinding in the article "The Use of Abrasives for Removing and Finishing Metal." The author—George Binns of Cincinnati Grinders, Incorporated—has spent many years in studying the action of the different types and kinds of grinding wheels under the widest possible range of working conditions, and gives without stint in this article.

—some of the interesting tools and methods used in "Ensuring Quality in Diesel Locomotive Production" at the plant of the Electro-Motive Corporation, LaGrange, Ill. The smooth operation of a Diesel-Electric Locomotive depends largely upon the quality of the gears, and H. C. Urbauer, who supervises the inspection of these parts, takes us through the several steps involved in checking the important dimensions on a finished gear. He also shows how threads are inspected with the aid of the latest in thread-inspection instruments.

—the usual "kinks" and "short-cuts," including one for spacing holes with a universal drill bushing, a good press tool for blanking and forming spring stock, a single-point threading tool that saves time, and so on. The articles are intended to be both interesting and helpful. We hope you like 'em.

The complete list of features, with page numbers, will be found on page 5.



# New Factory of Allison Division General Motors Is World's Most Modern

*This article describes and illustrates the new windowless, air conditioned manufacturing facility  
by General Motors Corporation for the Allison Division*

**T**HE world's newest example of modern factory planning, built by the General Motors Corporation at Indianapolis, Indiana, for the manufacture of aircraft motors, is ready for production. In fact, it is probable that by the time this article is placed in the hands of the readers, the factory will be running at full speed. Built without windows, completely air-conditioned, and artificially lighted, all the physical conditions of temperature, humidity, and lighting are completely controlled.

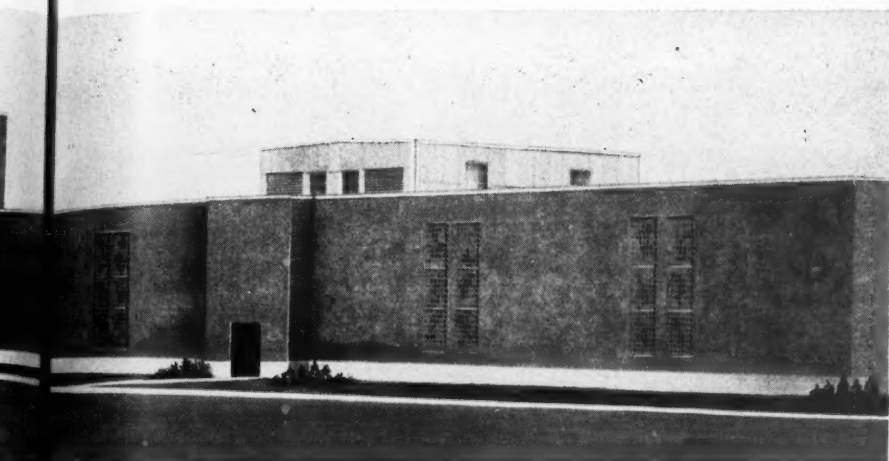
The plant consists of four buildings on 53 acres of land, the two principal buildings being the manufacturing

building and the adjoining office building. Construction is of brick, steel, concrete, and glass brick, trimmed with Indiana limestone. Welded construction of steel columns and trusses is used throughout. The interior of the windowless manufacturing building is painted with aluminum paint. Although windowless, eight large glass block panels have been provided on the north wall purely for architectural effect.

The large receiving room and the several entrances to the manufacturing building are designed to serve as air locks so that unconditioned air does not rush into the air conditioned

areas. Instead of rooms, there have been employee entrances in points where formed facilities

A complete operation also has with some tenancy and anodizing room,



# Division of General Most Modern Plant

*...ss, air conditioned, and artificially lighted plant built  
on the manufacture of aircraft engines*

areas when outside doors are opened. Instead of the conventional locker rooms, more convenient facilities have been provided for the plant employees by arranging groups of lockers in squares at three equidistant points in the plant. Modern lavatories are provided inside the squares formed by the lockers with toilet facilities on the mezzanine above.

A completely insulated electrically operated heat treating department is also housed in this building, together with separate housing for plant maintenance, a modern Diesel power plant, anodizing, dichromating and plating room, paint room, and shipping room.

The office room is a three-story structure, also completely air-conditioned, although not altogether artificially lighted. This building will house executive, engineering, accounting, and general office personnel and includes a doctor's office with hospital and first aid room, the entire third floor being devoted to a cafeteria.

The test building is a series of rooms with large open stack designed so the propellers on the engines on test will pull the air in through one stack and push it out through another. The fourth building is the small gate house. Buildings and streets are connected by concrete



Interior view of new Allison Division General Motors Corporation Plant at Indianapolis showing the new type of fluorescent lighting which provides five times as much light with only seven-tenths as much current required as older types of factory lighting.

drives and walks.

Air conditioning equipment which heats or cools, controls humidity, and cleanses air is housed in four pent-houses on the roof of the manufacturing building. The air conditioning facilities are so designed that much of the year it will be possible to take advantage of natural air at the required temperature and humidity. To guard against failure of the air con-

ditioning equipment, the equipment is divided into eight independent units each capable of providing 52,000 cubic feet of air per minute, which is far beyond the requirements. If a unit should temporarily fail, the remaining units have more than enough capacity to maintain proper ventilation conditions.

The manufacturing building is equipped with the first large scale

Locker, wash room and toilet unit in new Allison Division Plant. Three of these units are located at equidistant points in the plant to provide convenient access by the workmen.



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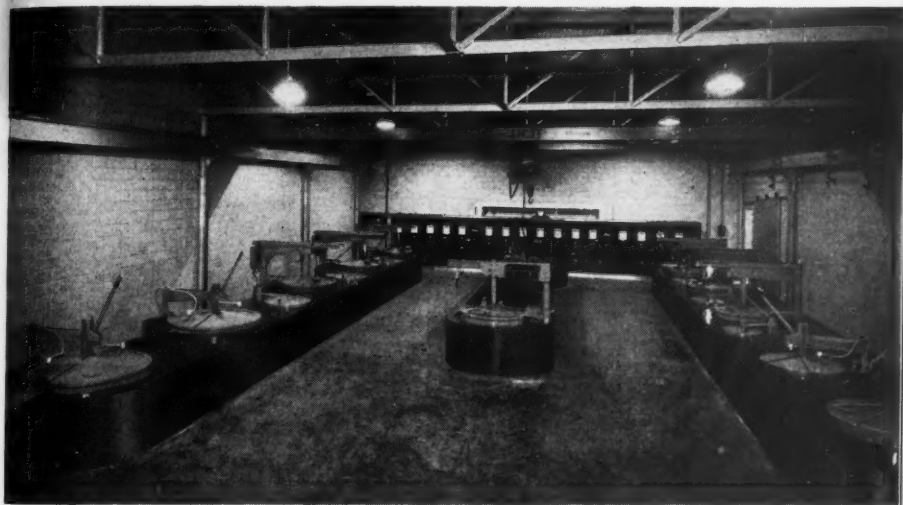
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application of a new type of fluorescent lighting unit developed by Westinghouse. The color of light produced by these units is so close to daylight that it is practically impossible for the layman to detect any difference. Each lighting unit is equipped with three 40-watt lamp bulbs, each 48 in. long and  $1\frac{1}{2}$  in. in diameter, coated with a fluor-

can be held in the hand without discomfort.

In view of the nature of the operations to be performed here and the fact that air conditioning and artificial lighting are vital, an uninterrupted flow of electric power is essential. Using the plant's own battery of transformers, the power lines of the local electric utility have been

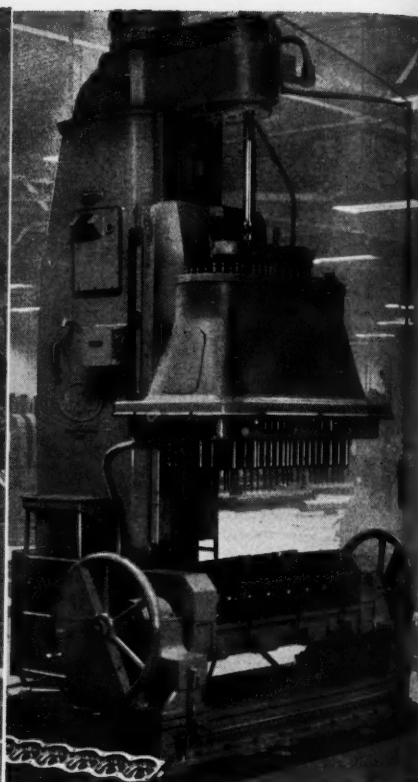
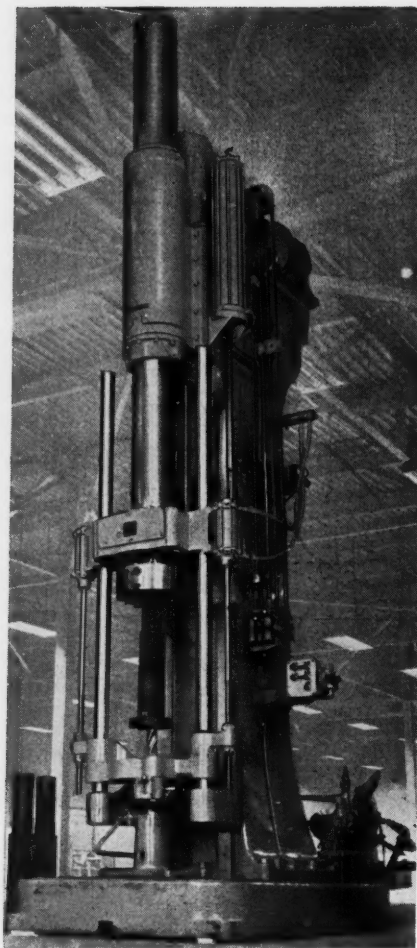


Heat treat department. All furnaces are electrically heated and atmospherically controlled. Homocarb furnaces are used primarily for clean carburizing and clean hardening and vapocarb furnaces will be used on work that must be hardened with a minimum of distortion. Homo furnaces are used for tempering operations and a homo nitridor is used to produce the extremely hard case required on nitrided materials.

escent material and filled with mercury vapor. Each lamp bulb is housed in a separate aluminum reflector, three to each complete luminaire and the units are spaced  $12\frac{1}{2}$  x 13 ft. at a point  $14\frac{1}{2}$  ft. above the floor. Average illumination at the machine or bench is approximately 30 foot-candles. One of the most interesting features of the fluorescent tube is its lack of heat; one of the lighted tubes

paralleled with the plant's own Diesel power plant, using Diesel engines of the same type as those which drive the General Motors-built Diesel locomotives. The two sources of power are hooked together shoulder to shoulder so that upon a moment's notice the entire plant load can be shouldered by either, or part from one source and part from the other, as economy or emergency dictates.

The arrangement of furnaces and



(Above)—With this multiple spindle drill more than 50 holes are drilled and counterbored simultaneously in the engine cylinder heads.

(Left)—This Barnes Hydram drills a hole more than 4 in. in diameter and 28 in. deep in a hardened steel shaft in approximately half an hour. This operation formerly took several hours.

control apparatus in the heat treating department further illustrates the advanced thinking involved in the design of this plant. Normally, heat treating furnaces are set on the floor. Since the furnaces are usually some five feet high, the average workman must either reach up to tend the furnace or stand on a platform, and servicing the lower part of the furnace is a rather unhandy proposition.

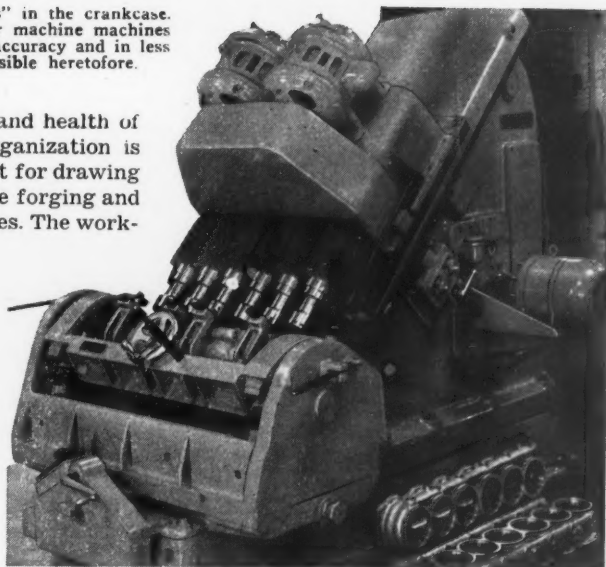
forcing the mechanic to work on the floor. In this plant all of the heat treating units are half sunken through apertures in the floor, bringing the door of the furnace at a convenient height for the workman. If servicing of the lower part of the furnace is necessary, the mechanics can work in a normal position in the basement room located underneath.

An example of the thought that is

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Drawing

Boring the cylinder "necks" in the crankcase. This Ex-Cell-O six-cylinder machine machines the six holes with greater accuracy and in less time than has been possible heretofore.

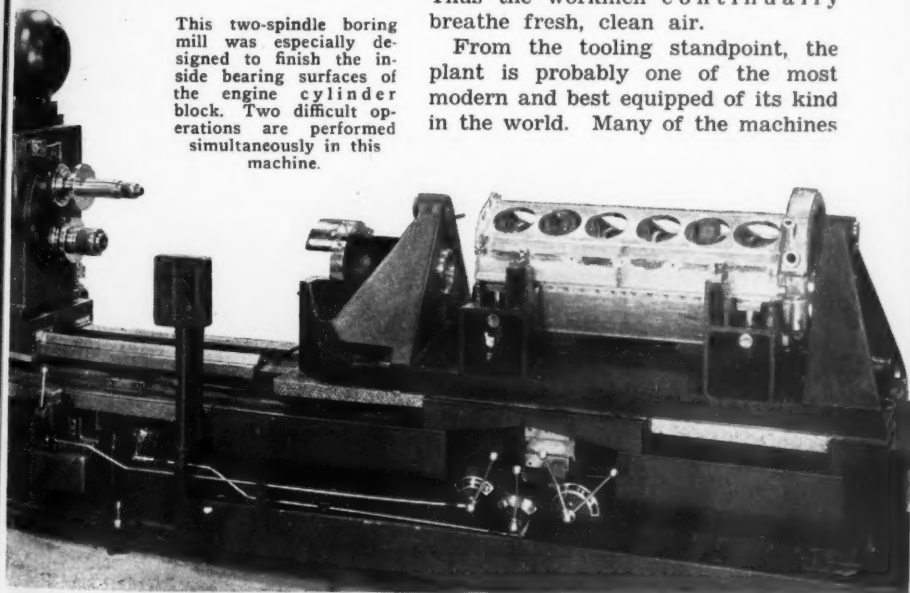


Given to the comfort and health of the manufacturing organization is found in the equipment for drawing off metal dust from the forging and casting cleaning benches. The workmen on this operation sit at long metal tables in the front of each of which is a slot connected with a central blower which draws all the dust and small metal particles across the surface of the table, down into tubes connected with a central exhaust pipe, to be expelled at a safe point. Drawing the air out through the

blower tubes also acts to draw in an adequate supply of conditioned air which enters at the top of the room. Thus the workmen continually breathe fresh, clean air.

From the tooling standpoint, the plant is probably one of the most modern and best equipped of its kind in the world. Many of the machines

This two-spindle boring mill was especially designed to finish the inside bearing surfaces of the engine cylinder block. Two difficult operations are performed simultaneously in this machine.



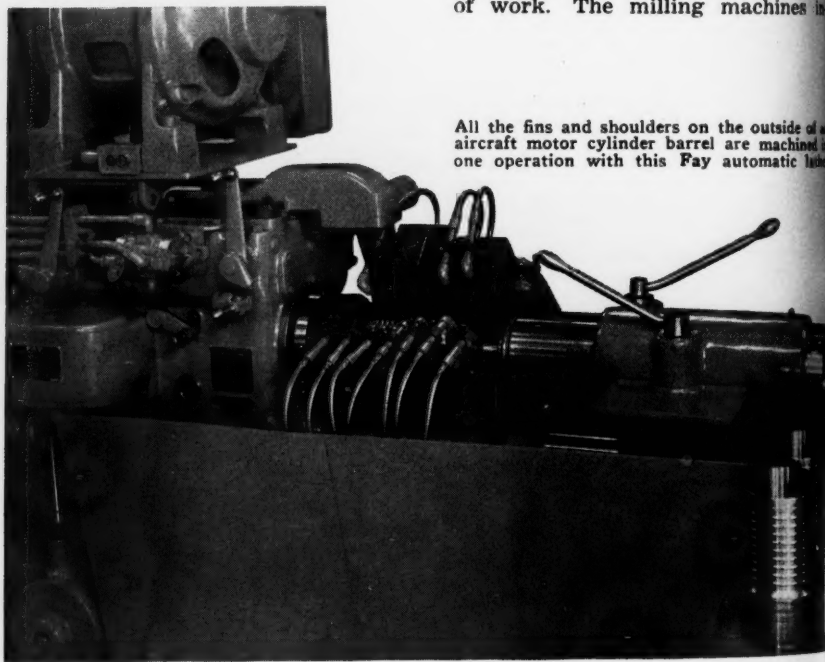
and fixtures have been especially designed for the operations on which they are used. Quantity production of a product requiring the highest type of precision manufacture creates new problems, to be solved by the application of new principles.

An outstanding illustration of the application of these principles to the tooling is found in the task performed by one large, specially designed drill. In fabricating the propeller shaft for one of the various types of engines it is necessary to bore a hole approximately 3 in. in diameter to a depth of about 20 in. in an alloy steel forging. This operation must be very accurately performed in that wall thickness tolerances are held within limits of a few thousandths of an inch. On the best available equipment used previously this particular operation has taken several hours.

The new machine, equipped with a specially designed drill, does the job with equal accuracy in about 18 minutes.

All machines and equipment are uniformly painted with an attractive shade of light gray paint, which gives the plant a neat and pleasing appearance. The light shade is used rather than a darker one so that dirt and grease will be visible rather than hidden with the idea that the operators will make a point of keeping their equipment clean. Chrome plating is liberally used on exposed parts of the machines. Carefully planned grouping and wide, convenient aisles contribute to the orderliness of the shop.

Practically every type and kind of modern production machine is represented, the machines being selected after careful consideration of present and future requirements on this class of work. The milling machines in-



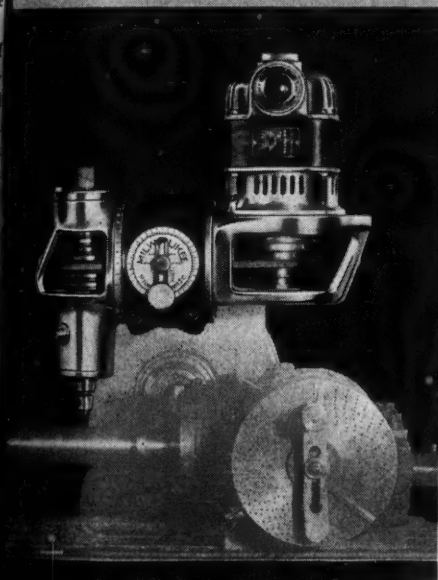
All the fins and shoulders on the outside of an aircraft motor cylinder barrel are machined in one operation with this Fay automatic lathe.

# ANNOUNCEMENT...

The Midgetmill and Speedmill, high-speed milling attachments formerly produced and sold under the name of DALRAE by the DALRAE TOOLS CO., Syracuse, New York, are now part of the K&T Milwaukee line of modern milling machine attachments and accessories.

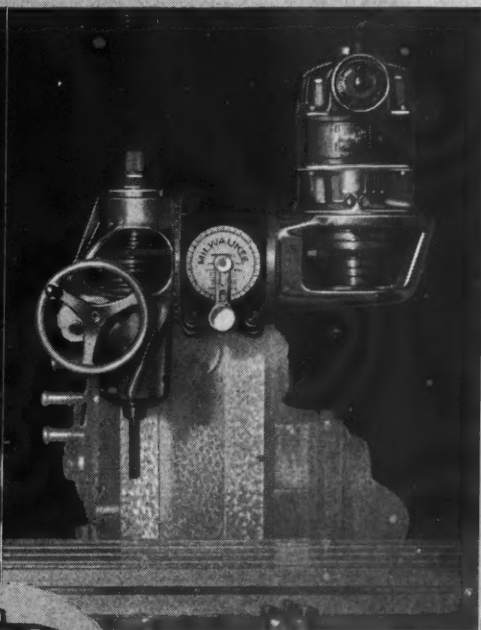
The efficient design and high quality of construction of both the Midgetmill and the Speedmill will be maintained — in keeping with the accepted and recognized K&T Milwaukee Milling Machine standards of performance and quality.

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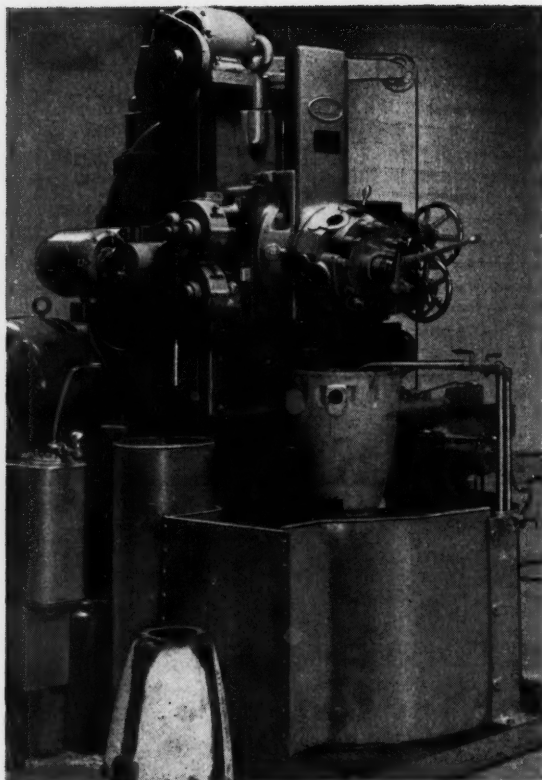


## The MIDGETMILL

— Designed to get the most from small tools by providing the necessary high speeds. Equipped with the "Thou-Meter" giving a continuous reading in thousands at which the tool is operating. Completely universal — adaptable to any milling machine — fast, safe and easy to set up.



MILWAUKEE MILLING MACHINES



One of the newest models of vertical turret lathes, used here for rapid and accurate machining of the inside of the engine gear case.

The drill is mounted vertically but is stationary on the base of the machine, and will drill to a depth of 22 inches.

The grinding equipment includes thread grinders of the external and internal types, the internal grinding machines for some of the parts being of special design and the first of this type to be used for production work. Gears are finished by the use of gear grinding machines.

The entire plant is laid out for progressive machining and assembling. Rough parts enter the machining departments at one end and progress through into a final inspection and then into the finish stores. Sub assembly departments are located between the finish stores and the assembly floor so that the sub assemblies can be made up from parts drawn from stock and then moved on to the final assembly department.

To the experienced observer it will be at once apparent that into the planning of this plant have been put all of the best planning ideas, developed through decades of planning in the world's greatest production factories.

See "Where To Find It" Section, pages 248, 249 and 250.

clude hydro-tels, hydraulically operated with the latest type of controls, and designed to produce a finish to profilometer measurements. Boring mills of the horizontal type are used to machine the intricate shapes which are characteristic of modern aircraft engine designs. Small, sensitive drills for drilling and tapping the smaller and lighter parts are equipped with hydraulic attachments for deep hole drilling. Some of the larger drilling machines are especially designed for their jobs. For instance, one machine has a 10-in. hydraulic cylinder and the work is chucked in the vertical position and rotated around a drill 4-5/32-in. diameter and 44 in. long.

Throughout Industry...



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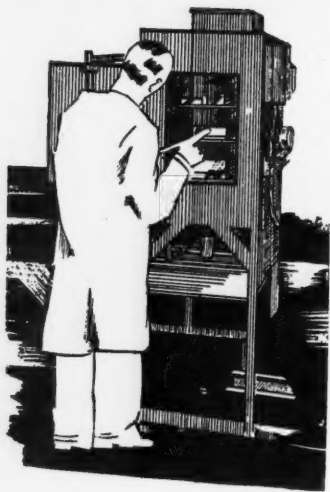
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We illustrate a high-speed, all-g geared Super-Service Radial — recently installed at Reed's Houston, Texas, plant — boring 180 slush holes per hour,  $\frac{1}{2}$ " diameter by 4" depth, in KK core bit heads. Both operator and foreman are pleased about this boost in production. You would be, too! Just drop us a line now, giving details of your drilling problems. There is no obligation, of course.

# THE CINCINNATI BICKFORD TOOL CO.

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# Tool Steel for the Non- Metallurgist

*In this, the second article of the series, the author discusses the characteristics of Oil Hardening and Air Hardening Tool Steels and High Speed Steels*

By H. E. REPLOGLE  
Crucible Steel Company of America

**H**AVING learned what the four basic types of tool steels are and the major characteristics of the different types, the next question that arises in the mind of the steel user is "What makes a steel oil hardening?" As regards the type commonly designated as Oil Hardening Tool Steel, the addition of a substantial amount of manganese plus small amounts of chromium and tungsten or chromium and vanadium will give a steel the ability to harden when heated and immersed in oil.

As can be expected, however, the change embraces more than the factors of analysis and the quenching medium. First of all, the addition of these alloys in increased amounts has affected the machinability somewhat. Using Carbon Tool Steel as a standard of machinability with an index of 100, the oil hardening type tool

steel shows an index of about 81.

After heat treatment, however, the Oil Hardening Tool Steel will be found to show much less average size change, which is of great importance with any type of work. Due to the slower speed of cooling necessary, less strain is set up in sections involving corners or abrupt changes of section.

As regards edge keenness, a slight loss will be found in comparison with the Carbon Tool Steels, but this is seldom serious enough to affect the picture unless finishing properties are most important.

A fourth change in characteristics which will be found with the Oil Hardening type is the fact that it hardens all the way through in large sections as compared to Carbon Tool Steels which, depending on limitations of size and grade, will show a

core. However, it will usually be found that if equivalent sections of Water and Oil Hardening Steels which have hardened all the way through are compared, the oil hardening section will have increased toughness.

The deep hardening characteristic of Oil Hardening Tool Steels will usually be found to be a detriment in cases where heavy shock is involved. In such cases the lack of a tough supporting core usually results in failure of the tool or die by splitting. However, if frequent resharpening is done on dies or punches, this feature will assure much longer life, as there will be no case to grind away.

In addition to the high manganese types of Oil Hardening Tool Steels, there is another kind, the marked characteristics of which adapt it to special kinds of service. We will consider here three kinds of steels: (1) High Manganese, Chromium, Tungsten; (2) High Manganese, Chromium, Vanadium; (3) High Carbon, High Chromium.

strains and size change. This same factor permits more complicated shapes to be hardened without fear of cracking in the quench, due to the fact that less intense strains are set up at critical points such as corners, and between abrupt changes of section such as would be found where there is a heavy section adjacent to a thin section. Examples of designs which are safely hardened in these types of Oil Hardening Tool Steels are presented in Fig. 4.

As a result of these definite characteristics these three steels are used extensively for blanking dies and punches, short run broaches, reamers, and form tools; as well as plug and thread gauges, the accuracy of which is very important and where grinding may not be possible or where a minimum of grinding is desired. Forming tools and dies of irregular contour can be made from these steels as well.

The third type of Oil Hardening Tool Steel with which the average shop man should be familiar is the

	ANALYSES					
	C	Mn	Si	Cr	V	W
Steel No. 5—High Manganese, Chromium, Tungsten	.90	1.15	.25	.50	—	.50
Steel No. 6—High Manganese, Chromium, Vanadium	.95	1.65	.40	.60	.20	—
Steel No. 7—High Carbon, High Chromium	2.25	.25	.45	12.00	.25	—

The response to heat treatment of the first two steels listed above is practically the same except in very large sections, such as 6-in. and 8-in. rounds, when it will be found that Steel No. 6 will show slightly higher hardness values across the face than will Steel No. 5. These steels require a less rapid method of quenching in order to secure full hardness, with a corresponding lessening of quenching

type commonly designated as "High Carbon-High Chromium." This steel, which we have designated as Steel No. 7, was developed primarily for one single characteristic; abrasion resistance. This characteristic is present to a large degree, but as so often happens, the securing of this very remarkable improvement has necessitated the lessening of other important features.

It will be noted that the carbon is very high, amounting to 2.25 per cent. This, in combination with a high chromium content of 12 per cent, produces the wear resisting characteristics which were desired. However, in the annealed condition as purchased by the shop, this steel—due to these two elements—is difficult to machine, drill, or tap, and heat treatment involves a high

speeds and cuts are not excessive, has given good results on form tool for brass.

Briefly summing up Oil Hardening Tool Steels, we can say that the following are their main characteristics:

1. Being Oil Hardening, they are less susceptible to cracking in the quench (with difficult sections) than Water Hardening Tool Steels.

2. Due to the fact that they require a less drastic and somewhat slower quenching speed, they harden with less distortion.

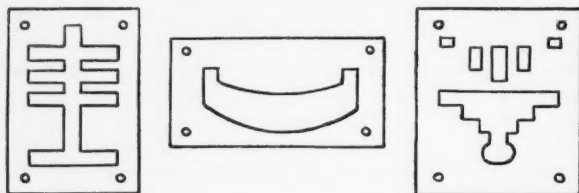
3. Coincident with the ability mentioned in paragraph 2 is the fact that they harden deeply or

all the way through. For this reason they are less tough under impact than Carbon Tool Steels, which harden with a core, but will permit more grinding and resharpener.

4. They have sacrificed some edge keenness as compared with Carbon Tool Steels.

5. In the case of Steel No. 7, the High Carbon-High Chromium type, a great improvement in wear resistance has been developed, but at the expense of a lessening in transverse strength.

As is true with all general types, the Oil Hardening group has fulfilled the requirements for a certain kind of work involving more or less definite design requirements. In their niche they are the best. However, if they are used on jobs for which they are not suited, they may be the poorest choice, as is the case with all types misapplied.




Examples of designs which, in Oil Hardening Tool Steels, can safely be hardened.

quenching temperature of from 1,750 to 1,800 deg. F. However, this type of steel can be depended upon to respond to heat treatment with very little size change and can be considered the equal of Steels No. 5 and No. 6 in respect to this feature.

As can be expected, the elements which make this steel highly resistant to abrasion in service naturally make it more difficult to grind. As a result, care must be taken in this operation, making sure the proper wheel is selected.

As to the application of this steel, one very important point must be kept in mind. Due to the high carbon and chromium content, there has been a corresponding lessening of transverse strength. Designs which will result in undue stresses in this direction should be avoided. Properly applied, this steel can be depended upon to give long runs on tough, abrasive metals, as well as on thin materials such as tin plate. When

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## Air Hardening Tool Steels

Since we have described the elements which in various steels make them Oil Hardening, it should be explained why certain steels are Air Hardening. The element which is most important in affecting this characteristic is molybdenum. In the case of the tool steels commercially known as "Air Hardening," molybdenum is this element which determines the difference between ability to harden in oil or in air. (The addition of tungsten in considerable quantities will produce the same characteristic. This will be discussed under the heading of High Speed Steels.)

While the applications for an Air Hardening Tool Steel are very similar or the same as those for an Oil Hardening type, this ability to harden in air has imparted definite, easily recognizable traits which make it different from the Oil Hardening type. In the main, these traits react to the benefit of the production man, but again we have a condition where in order to obtain certain desirable characteristics such as air hardening qualities it has been necessary to accept some characteristics not so desirable.

As the name implies, these steels will harden in air, as a consequence of an appreciable addition of molybdenum. Due to the fact that a much slower quenching or cooling rate is

distortion. This is probably the most outstanding characteristic and one of the greatest benefits to the user. Closer tolerances on all classes of work require that tools be made up in the same way. It is, of course, very important that a minimum of expense be involved in finishing after tools have been heat treated. The ability of this type of steel to hold very close to size fulfills both requirements with usually a consequent saving to the user in spite of an average higher cost for the material.

Due to the fact that Air Hardening Steels are of a higher alloy, it will be found that they are more difficult to machine. For the same reason an average higher hardening temperature is necessary. Also, because of the higher alloy content, they will be found to be more difficult to grind after heat treatment (except Steel No. 7, a High Carbon-High Chromium which is equally difficult, but will be more abrasion resistant than the straight oil hardening types). Some sacrifice has also been necessary as regards keenness of the cutting edge. However, except in a few cases, this has little bearing for the majority of applications.

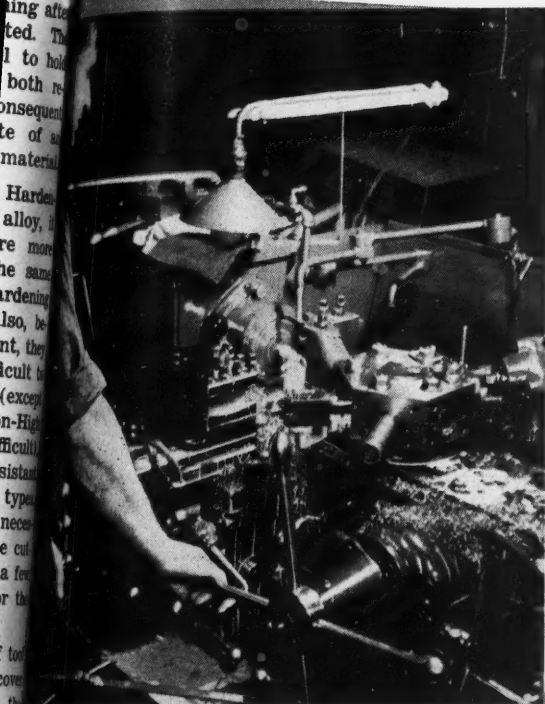
Of the Air Hardening kinds of tool steels, there are three which cover the majority of requirements in the average shop. The analyses are as follows:

	ANALYSES				
	C	Mn	Si	Cr	V
Steel No. 8	.95	.40	.30	5.25	.50
Steel No. 9	1.50	.30	.30	11.50	.20
Steel No. 10	2.30	.25	.45	12.00	.25

necessary, however, less intense strains are set up in the hardening phase with a consequent lessening in

It will be seen that steels No. 8 and No. 10 are very similar to steel No. 7 in that they are high chromium

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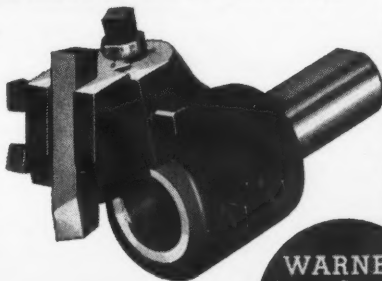
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types. They differ in that steels No. 9 and No. 10 contain molybdenum and in one case—steel No. 9—the carbon content is lower. In the case of steel No. 8 it will be noted that both carbon and chromium are considerably lower although the molybdenum is somewhat higher. This has resulted in a steel that will more easily be machined and ground and which has a lower abrasion resistance but greatly increased transverse toughness.

In cases where the use of a High Carbon-High Chromium die steel is definitely indicated, the use of steel

more closely after heat treatment with longer life, than the oil hardening group, excepting steel No. 10 which is a High Carbon-High Chromium steel. The response to heat treatment of these three steels is as follows:

It will be seen that after heat treatment these Air Hardening Steels possess excellent characteristics as regards hardness, size change, and resistance to wear. With such excellent potential results available, a thorough study should be made to determine whether or not these steels can be applied on jobs where such

Tempered at	Steel No. 8	Rockwell C	Steel No. 10
	1,800 deg. F. Air	Steel No. 9 1,800 deg. F. Air	1,800 deg. F. Air
As Quenched	64	64	65
400 deg. F.	61	62	63
500 deg. F.	59	60	60
600 deg. F.	58	60	59
700 deg. F.	58	59	59
800 deg. F.	57	59	59
900 deg. F.	58	59	60
1,000 deg. F.	58	57	56

No. 9 is undoubtedly the best choice for the widest number of applications. This steel will be found to machine and grind easier than steels No. 7 and No. 10. It will respond to heat treatment with less average size change and possess greater inherent toughness. For some jobs where abrasive conditions are extreme, increased wear will probably result from the use of the 2.3 per cent carbon type, as possessed by steels No. 7 and No. 10. However, in the majority of instances steel No. 9 will be the best choice.

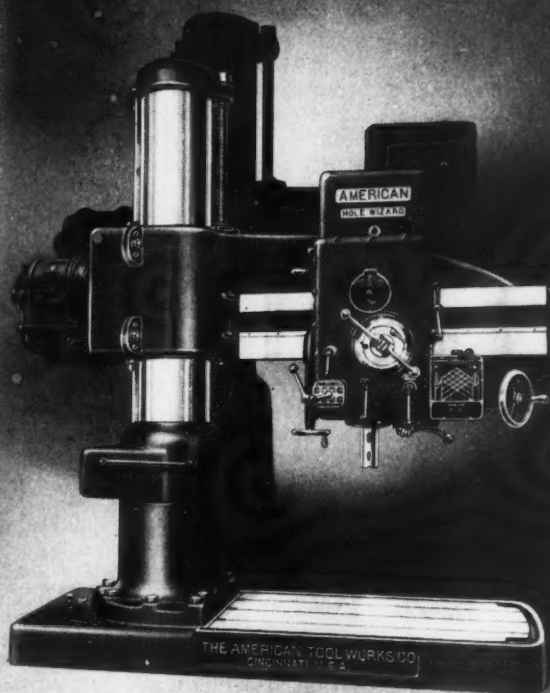
For tool and die applications the air hardening types are suited for the same service as the oil hardening types. As mentioned before, the chief difference is that they will hold size

improvements are desired.

### High Speed Steels

High Speed Steels received their name by more or less popular consent. These steels, used for cutting tools almost exclusively, permitted greatly increased cutting speeds and thus became known as "High Speed Steels."

It is only natural that the reader should be interested in the elements which give these steels this very important property. It will be remembered that the steels known commercially as "Air Hardening" are influenced most by molybdenum. In High Speed Steels the most important element is tungsten. The presence of this element, plus smaller amounts of



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chromium and vanadium in proper balance, provides a steel which requires a very high hardening temperature and which requires a very high tempering temperature to bring forth its maximum hardness. It is the ability of these steels to maintain a high hardness after tempering at 1,050 deg. F. that assures the maintenance of this hardness when subject to the high frictional heat that is developed in cutting. As previous-

duction plants need or can profitably use as many kinds of high speed steel. It is, therefore, better that we confine our choice to a few which will meet the greatest number of requirements in the cutting field. All of these steels differ in analysis and due to this can be expected to show special traits which make them preferable for certain work.

The table below lists the seven most widely used High Speed Steels

Type	ANALYSES							
	C	Mn	Si	Cr	V	W	Mo	Co
No. 1, 18-4-1	.70	.30	.30	4.00	1.15	18.00	—	—
No. 2, 18-4-1-5	.75	.30	.30	4.00	1.15	18.00	.50	5.00
No. 3, 18-4-2-8	.80	.30	.30	4.00	2.00	18.00	.50	8.00
No. 4, 14-4-2-5	.80	.30	.30	4.00	2.00	14.00	.50	5.00
No. 5, 18-4-2	.85	.30	.30	4.00	2.00	18.00	.75	—
No. 6, 8-4-1-1.5	.80	.30	.30	4.00	1.15	1.50	8.50	—
No. 7, 8-4-2	.85	.30	.30	4.00	2.00	—	8.50	—

ly mentioned, this same addition of tungsten makes them air hardening as well.

Most of us are familiar with the phrase "burned out," indicating a condition where the cutting edge of a tool is destroyed and will no longer cut. The reason for such failures is simply that the frictional heat developed in cutting was in excess of the tempering temperatures. When this occurred the tool began to soften on the cutting edge, wearing away rapidly and presenting a greater area to be heated by friction, thus speeding up the failure.

There are at present commercially available about twelve separate and distinct kinds of high speed steels. With such a choice it is possible to match up special cutting conditions with special high speed steels whose strongest characteristics will meet the necessary requirements.

However, very few shops or pro-

No. 1, the 18-4-1 type, is the most widely used for the greatest number of applications. It can be considered as the best all around high speed steel for general purpose work. It is well adapted for use as a single point lathe, planer or shaper tool as well as for form tools, hobs, and cutters. The usual carbon range is .70 to .75. Not being subject to excessive decarburization, it does not require special heat treating equipment although, of course, the better the equipment, the better the results, as a rule.

No. 2, the 18-4-1-5 type, will be seen to be almost exactly the same as type No. 1, except for the addition of cobalt and a small amount of molybdenum. With the added cobalt this type is capable of withstanding higher tool temperatures but with a slight lessening in toughness. While it will take heavy hogging cuts on abrasive materials, it does not possess quite as good finishing charac-

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teristics although it will still do a good job on this class of work. It is usually used for single point tools, although in many cases it is made up into form tools and cutters. Due to the presence of cobalt it is susceptible to decarburization in heat treatment, and, therefore, requires protection during heat treatment.

No. 3, the 18-4-2-8 type, is similar to type No. 2, except for an increased amount of cobalt and vanadium. This increase results in the development of even higher red hardness than type No. 2, but with some sacrifice in toughness. It is generally used for the same class of tools as type No. 2 and must be protected during heat treatment in the same way, unless complete grinding is possible.

It is evident that No. 4, the 14-4-2-5 type, has somewhat been modified. Tungsten has been lowered to impart greater toughness, and vanadium has been increased to impart greater abrasion resistance. Cobalt has been added to assure high red hardness. Suitable for single point tools and often used for simple form tools and cutters, it may be considered the toughest of the cobalt-tungsten high speed steels. It has shown up unusually well for machining stainless and is excellent for fairly high cutting speeds on heat treated and abrasive metals. Due to the cobalt content, it requires protection during heat treatment as do types No. 2 and No. 3.

A comparison of the analysis of No. 5, the 18-4-2 type, with type No. 1, shows it to be exactly the same except for a higher carbon content and an extra per cent of vanadium. Suitable for single point tools or multiple point tools such as broaches and cutters, as well as for form tools, it has higher resistance on abrasive metals and will produce an excellent finish. It is usually used on heat

treated alloys of medium hardness where medium cuts are needed, and is not specially susceptible to decarburization during heat treatment. It is somewhat more difficult to grind after heat treatment than the 18-4 type.

Types No. 6 and No. 7 are the most widely used of the molybdenum high speed steels. They have high toughness characteristics and good cutting qualities. Used for both single and multiple point tools and capable of giving an excellent finish, these steels like the Cobalt High Speed Steels are subject to decarburization and therefore require protection during heat treatment unless complete grinding is possible.

When discussing high speed steels with the man who uses them, it will often be found that he has a favorite and will use no other. In the majority of cases a careful study of his work will show that his favorite is the best selection for the jobs he is doing. This is not always the case, however, and it is a good idea for any shop man to try to analyze the requirements of his job and then pick a high speed steel which will most closely match the requirements of that job. If the shop man will do this, he will often find that types are available which will do a better job than was possible before.

As stated earlier, few shops like to use too many types of high speed steels. If the management wants but one type, the first listed (18-4-1) is undoubtedly the wisest choice. If more than one can be economically stocked, the manager can safely choose one or more of the types described and be pretty sure that they will give a good account of themselves. The most important thing in the use of high speed steel is to match up the job

(Continued on page 243)

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# Dependable!

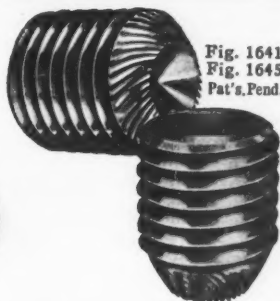


Fig. 1641  
Fig. 1645  
Pat's. Pend.

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Fig. 1434 Knurled  
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Socket Head Cap  
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Fig. 232  
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Hollow Set Screw

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# The Use of Abrasives for Removing and Finishing Metal

By GEORGE BINNS

THE removal of metal by the use of abrasives is an ancient art, dating back to the pre-historic days when abrasive action was employed to shape and sharpen weapons and cutting tools. An edge, more or less keen, was an essential, and we find that it was produced by rubbing the metal implement on an abrasive rock.

The art of grinding did not advance much beyond this point of rubbing a piece of metal against the natural piece of abrasive stone, except for the application of power, until a comparatively few years ago. Even today, keen edges on cutting tools are produced in this manner.

The next step in the art of grinding was an effort to produce an accurate cylinder. So far as we know, this was first done about 80 years ago by a New England firm, Wilcox and Gibbs, who manufactured sewing machines. They needed a more accurate finish for a hardened reciprocating needle bar, and they obtain-

ed it by applying a simple belt-driven grinding wheel head to a lathe. Incidentally, there are places where similar arrangements are still in use.

In 1864, Brown & Sharpe built the first cylindrical grinder for the market. It was a very simple machine, built up from a frame of what was then known as the Putnam 14-inch lathe, but it was the real beginning of the modern cylindrical grinder.

Progress in the development of grinding machinery was exceedingly slow until the advent of the idea of mass production and the demands of the automotive industry. For the first time a really accurate duplication of parts became a vital necessity, both for rapid assembly and for replacement in the field. Machine development was stimulated, one of the forward steps being the invention of the centerless grinder, which did a great deal to dispel the impression that

grinding operations were necessarily slow and expensive.

It soon became apparent to machine tool builders that weight and strength were important factors in the development of accurate grinders, and that good lubrication facilities were necessary to maintain this accuracy under service.

Design then began to move toward lighter and faster-moving parts, made from stronger and harder materials. The metallurgists made the necessary materials available and the machine tool builders developed an extensive line of grinding machines of various types which made possible the required degree of accuracy. At the same time, abrasive manufacturers produced an abrading material for their grinding wheels far superior to the old natural stones. Today's modern high speed machinery is a logical development along these same lines.

As an example of what accurate grinding has made possible, we might cite the case of the modern industrial sewing machine which, with very little noise or vibration, can take 7,000 stitches per minute, or of the modern military airplane which travels at a speed of 6 to 7 miles per minute.

Greater speeds will be possible only

as the metallurgists are able to give us better materials and the machine tool builders provide better machine performance to ensure greater accuracy. We must realize that further progress of civilization in this mechanical age rests squarely on the shoulders of (1) the metallurgists to give us the materials, and (2) the machine tool builders to produce the necessary accuracy and finish.

With this picture as a background, let us discuss some of the problems of grinding.

There are several distinct types of grinding machines: (1) The simple bench or snagging grinder. (2) The tool and cutter grinder. (3) The precision cylindrical grinder which is made in plain, universal and centerless types. (4) The surface grinder which is made with a vertical spindle and which uses the side face of the wheel for cutting, or with a horizontal spindle, using the periphery of the wheel. (5) The internal grinder which is made in plain and automatic

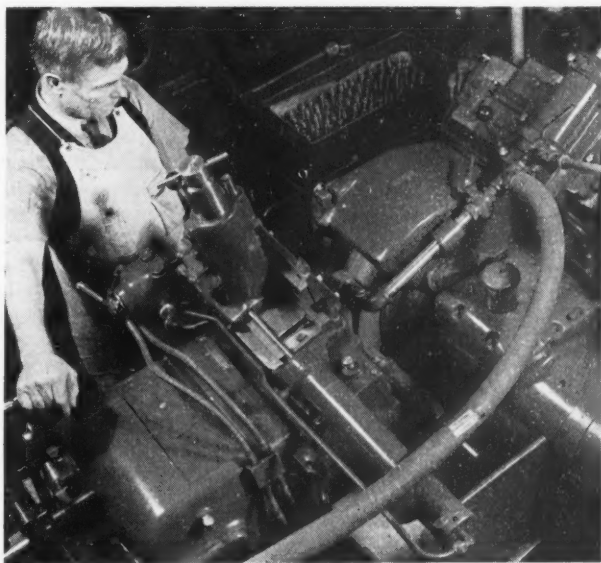


Fig. 1—With this No. 2 Centerless Grinding Machine, two diameters of knuckle pins for airplane engines are ground to a mirror finish.

types and which may be designed on the centerless or chucking principle. For large work, machines of this type are constructed along the lines of the planetary machine, so that heavy work need not be revolved. (6) Cam and crank grinders. (7) Gear grinders. (8) Thread grinders.

From this we may see that grind-

the ones to be considered in this article.

In grinders, just as in any other machine tool, performance is limited by two factors: (1) The ability of the cutting tool to cut the material at hand, and (2) the ability of the machine to properly drive the cutting tool. Each of these in turn is limited by the other, but

we know that as the metallurgists and ceramic engineers make better cutting tools available, the machine tool builders will produce machines that can drive them to the limit.

This "cutting edge verses the machine" is similar to the old story of armor plate versus the artillery, but the results are quite different. To make better armor doesn't mean a thing because better guns are immediately developed which will pierce the better armor, and we are right where we started. But

give us better cutting tools, and by making better machines to drive them, we will have made real progress in the mechanical arts. We will have advanced civilization and raised the standard of living.

Now let us look at the limiting factors in a grinding operation. The grinding wheel, the same as any other cutting tool, puts two distinct loads on the machine:

1. Contact pressure, which is the pressure necessary to keep the cutting edge in contact with the work.
2. Torque load, which is the power required to drive the

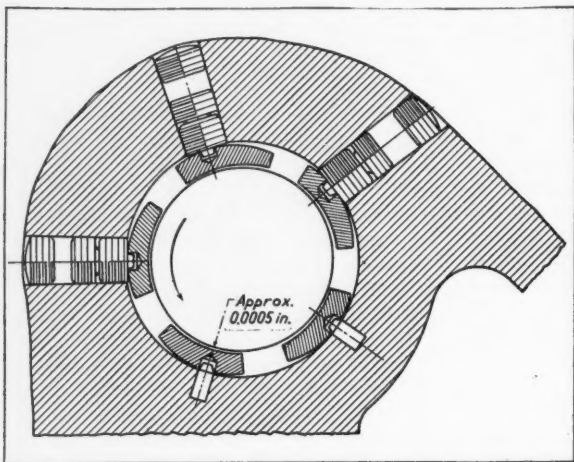


Fig. 2—Drawing Showing Construction of Filmatic Bearing. Rotation of spindle creates wedge-shaped oil films which develop high radial pressures, forcing the spindle into a central position.

ing machines are available today for accurately finishing any part that may first be machined by any process other than grinding. In other words, it is hard to conceive of anything that an engineer can design which cannot be accurately machined according to his specifications, even though it may be made of the hardest materials.

Each item of this long list of grinding machines includes distinct problems and there is much printed matter available on all of them, but there are some problems in grinding that are common to all of these various types of machines, and these are

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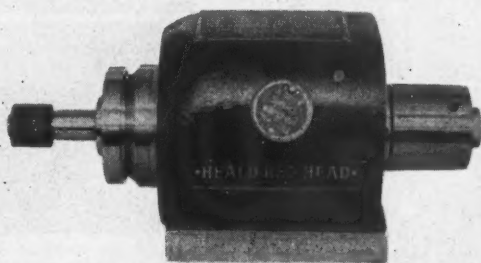
Exclusive features found in Heald Red Head design include among many positive and definite spring pre-loading which automatically compensates for expansion and contraction due to temperature changes and wear; use of angular contact bearings, super-precision in quality and built to Heald specifications.

Such features, plus unstinted use of fine workmanship and materials, are reasons why Heald Red Heads produce longer, satisfy longer. They help to get the most out of every precision grinding and boring job.



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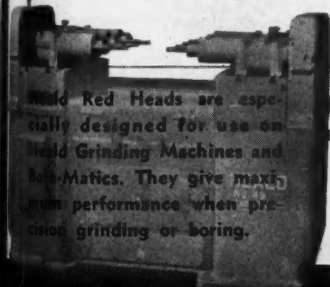


## PRODUCTION DOESN'T FAZE RED HEADS

This No. 185 Wheelhead boasts of grinding 1,820,000 holes for a roller bearing manufacturer. Nice record, but then every Red Head is designed to do a real production job.

Wheelhead—Style No. 185. Installed on—No. 81 Chuck. Operation—Grind taper raceway. Holes finished—1,820,000. Years service—4 years, 5 months and still O. K.

\*This head also turned over 17,470,000,000 trouble free revolutions without a bearing replacement.



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cutting edge along relative to the work.

Contact pressure is higher than cutting pressure, and accordingly contact pressure is the principal source of trouble in a grinding operation. It is the cause of inaccuracy

will remove metal and at the same time will deliver finish and accuracy. Whatever he may do to help obtain one of these results always reacts unfavorably for the other. As a result we usually have to use more than one grinding operation to obtain a really fine finish.

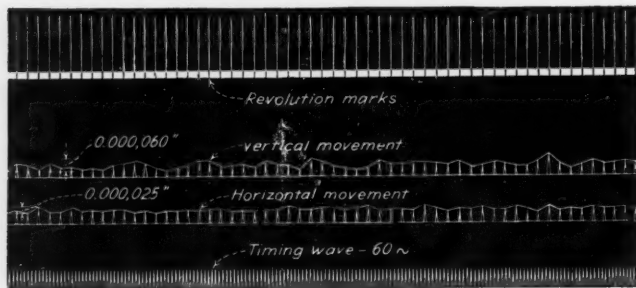


Fig. 3—Oscillogram Chart of Flutter in Old Style Bearing showing 60 millionths inch vertical and 25 millionths inch horizontal flutter.

and poor finish, and the machine tool builder has to put a great deal of extra mass and strength into the machine to offset the deflection which results from this pressure. It is very desirable, therefore, to have wheels which will cut with a minimum of contact pressure.

All other things being constant, the contact pressure is proportional to the linear inches of cutting edge in contact and in proportion to the depth of penetration, which is the reason why fine wheels are not suitable for fast metal removal.

This fact puts the wheel manufacturer up against a real problem, because he has to provide a tool that

to check the performance of both the machine and the wheel. A good grinding operation, using the periph-

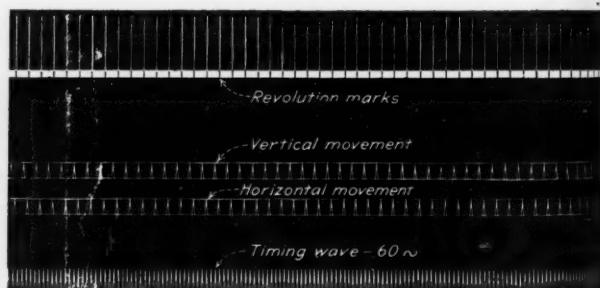
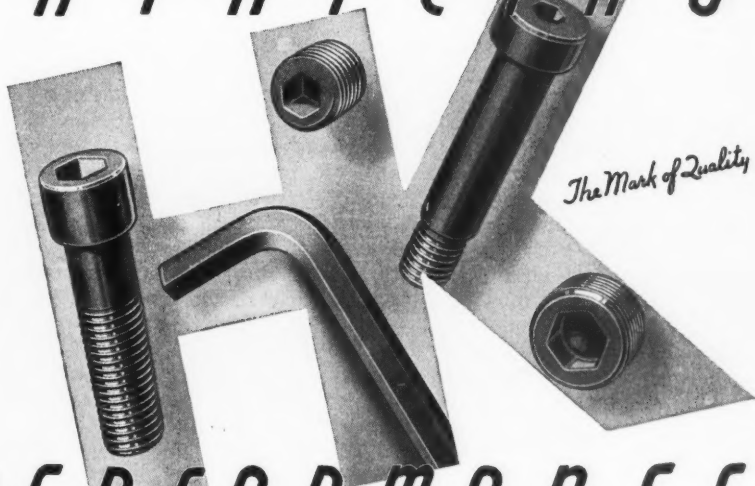


Fig. 4—Oscillogram Chart of Filmatic Bearing; no measurable flutter is developed.

ery of the wheel as the cutting edge should require no more than from 10 to 15 h.p. to remove one cubic inch of steel per minute. If more power than this is consumed, the reason probably is that the wheel is glazing or loading, and the excess pressure necessary to make the wheel cut

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FIBRO FORGED Socket Screws — the Screws that are COMPLETELY Cold Forged by the patented method whereby not only the exterior of the screw is forged but the actual socket, the side walls, the head, and every particle of the screw (threads excepted) is Completely Cold Forged.

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**SOCKET SCREWS**

HARTFORD, CONN. U.S.A.

British Representatives: GEO. H. ALEXANDER MCH., LTD., 82-84 Colehill St., Birmingham, 4.

probably damaging the work. Such a situation is usually remedied by using a softer, freer cutting wheel. A wheel must wear; that is, it must break down and lose its grains in order to keep sharp.

How fast should a wheel wear? This usually can be gauged by comparing the wheel wear to the cubic inches of metal removed. It should take about one cubic inch of wheel material to remove 10 to 15 cubic inches of steel. It may be interesting to note here that the average cost of one cubic inch of abrasive wheel will run around 5 to 6 cents. Also, that it takes 5 to 10 h.p. to drive one inch of wheel width at its maximum capacity. These figures are only approximations, but serve as a very good yardstick with which to check the performance on any grinding operation that is strictly a metal-removing job.

Very little printed matter is available giving basic information as to what a grinding wheel or a grinding machine should do, and all concerned are usually satisfied with any given grinding operation until they have seen a better performance on a similar job. Then they proceed to make life miserable for some wheel salesman.

The wheel salesman will probably give them a harder wheel and thus provide better wheel performance, but at the same time he has run up the power consumption, and while he may have increased production, he may also have set up conditions which will cause excess surface heating with resulting checks. Unfortunately, this fault does not always show up immediately after the grinding operation has been completed.

We know positively that the wheel used on the average grinding job to-

## Accurate but Low in Cost,

this Builders T Surface Grinding machine is just the thing for grinding tools, dies, and small machine parts. Such parts can be ground more cheaply on this machine releasing the large automatic grinding machines for the work for which they are intended. Low enough in price so that machines can be located here and there around the plant handy to the work that must be done.

**BUILDERS . PROVIDENCE**  
IRON FOUNDRY RHODE ISLAND

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Bulletin M-644*



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Haskins Flexible Shaft Equipment H-7, illustrated here grinding down old joint on a lift truck, was purchased by the Barrett-Cravens Company, Chicago, in 1926. Still in active use by the same company, it has done heavy-work for 14 years at an average maintenance cost of only \$8.90!

**On the job 14 years and still going strong!  
Proof that Haskins Flexible Shaft Equipment  
leads in Dependability • Performance • and  
Lower Cost Per Year!**

**IT'S THOSE** extra years of service that make Haskins Flexible Shaft Equipment the choice of cost-minded plant managers in all kinds of plants. For long after lesser machines are retired to the scrap heap, your Haskins Equipment will still be doing its job—quickly, dependably and without asking any more care than any good machine deserves. Whatever type of grinding, polishing, sanding or filing you have to do, figure the cost in years—and you'll see *why* you're money ahead with Haskins!

#### **FREE BOOKLET**

Shows more than 25 different types of Haskins Flexible Shaft Equipment powered and priced for every purpose—and with pedestal, bench, truck and ceiling suspended mountings. Illustrates scores of diverse applications. Write for your copy—it may give you a money-saving idea for your plant. R. G. Haskins Company, 619 S. California Ave., Chicago.



European Representative—G. E. Marbaix, Ltd.,  
Hungras House, London, S. W. 1.

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# **HASKINS**

**FLEXIBLE SHAFT  
EQUIPMENT**

day is too hard and that there is a lot to be gained by using wheels that cut more freely and are more open in structure.

This brings us to the subject of wheels. I assure you that the selection of the right wheel is an extremely complicated task, with so

ally known as the "grain" of the wheel. In a complete range of grain sizes, including standard combinations, there are about 100 variations.

The abrasive grains are held together by the bond, which is usually identified as "vitrified" or "elastic." There are five or ten variations

according to strength or to their ability to hold the grain in place. The relative amount of grains and bonding materials can also be varied, as can the grain spacing. This is ordinarily known as structure.

With all of these variables to play with, one can readily see that there are almost an infinite number of wheels that could be used on any given job. However, a good grinder man will know from experience approximately the kind of wheel needed for a given job, and the wheel manufacturers

can furnish long lists of wheel recommendations for various types of materials and classes of work. This, however, is only a starting point, and the good grinder man will watch the action of the wheel and check it against the test figures as a guide when ordering subsequent wheels.

Grinding machine manufacturers feel that there is a great deal of room for improvement in the grinding wheel, and probably the wheel manufacturer is sure that there is a great deal of room for improvement in the grinding machine. To prove that they are both right, we will cite a simple incident for each.

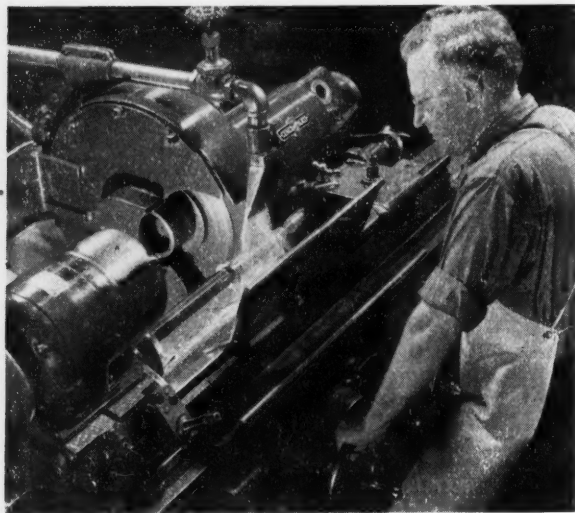


Fig. 5—Grinding Three Diameters of an Acme Thread Adjusting Screw on a Cincinnati 6 x 18-In. Plain Hydraulic Grinding Machine.

many variables to consider that it is practically impossible to select the right wheel for a given job by any process other than of elimination. We may be able to give you some idea of what these variables are.

Chemically speaking, there are two principal kinds of abrasives; i. e., aluminum oxide and carbide of silicon. These are of crystalline nature, and in the process of manufacture the shape of the crystals is changed and they are made more or less brittle. Abrasives may be graded in any size from 12 to the linear inch up to as high as possibly 600 or 800 per linear inch. The size of the abrasive is usu-

AS *Simple* AS IT IS *Effective!*

**T**HE SUPERIOR FEATURES of this cutter for rough and finish milling are conclusively proven by the many shops using it. The hardened cutter body is practically indestructible. Blades can be set out any amount desired, the adjusting being done quickly, easily, accurately. Substantial money is saved through the greater production in less time that the use of this Continental cutter invariably brings to milling operations.

One clamp locks two blades absolutely firm. No special tools necessary.



The Continental Tool Works Division of Ex-Cell-O Corporation has an interesting and a complete story on this milling cutter. It's in printed form. Use coupon to obtain a copy of it.

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**FACE CUTTER**



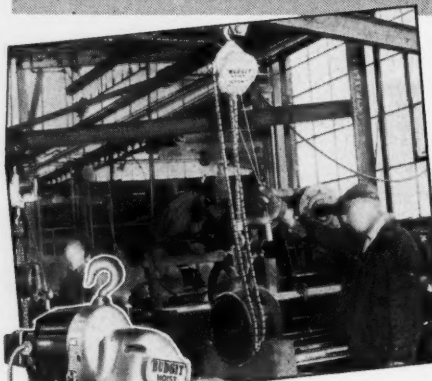
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*Precision*

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AND TOOLS**

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MANNING, MAXWELL & MOORE, INC.  
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Makers of all types and sizes of Electric and Hand-Operated Cranes and Electric Hoists . . . Send all your Crane and Hoist inquiries to Shaw-Box!

*Portable Electric*  
**'BUDGIT' HOISTS**

Let us consider the grinding wheel first. Why is that a narrow cut-off wheel is so efficient in metal removal? A grinding wheel  $\frac{1}{8}$  in. thick will cut into a bar of ordinary steel at a very rapid rate. In fact, it will cut a 2-in. diameter bar in about 30 seconds. If we take a similar wheel of triple the width and put it into a machine with sufficient rigidity to drive it, there seems to be no good reason why it should not cut at the same rate, because the wheel moving directly into the work as a plunge cut would have exactly the same unit load on the abrasive and each particle of abrasive would have no more work to do regardless of whether it was  $\frac{1}{4}$  in. wide or  $\frac{1}{8}$  in. wide. But it won't do it. The wheel simply refuses to cut. The bar heats up, and if the operation is pushed too hard, the wheel will break.

This fact might seem to indicate that the wheel manufacturer cannot make a  $\frac{1}{4}$ -in. or a  $\frac{1}{2}$ -in. wheel as good as he can make a  $\frac{1}{8}$ -in. wheel, but this may or may not be so. We only know that the narrow wheel performance is not possible with the wider wheel.

Some of the difficulty may be due to the fact that, of the total amount of energy released into the cut, the principal portion has to be absorbed by a rise in temperature of the bar. If the cut is twice as wide, theoretically there is twice as much heat to be carried off, but the bar is still the same size and will naturally reach a temperature where something will happen to prevent the grinding wheel from performing properly. To prove this, we know that you can materially affect the grinding operation by changing the temperature of the work at the start.

Now let us cite an example of change in machine design which resulted in a tremendous difference in

# Hicycle SUSTAINED SPEED



**SAVES** GRINDING  
WHEELS  
INCREASES PRODUCTION

The high sustained speed of Hicycle Portable Electric Grinders results in more efficient grinding and prolongs the life of grinding wheels. In one foundry, the high sustained speed of CP Hicycle grinders has increased the life of

wheels more than 33 1/3 %. » » » If you use more than six grinders, buffers, sanders or polishers, change to CP Hicycle . . . raise your production 25 % or more . . . increase the life of abrasive wheels or discs at least 25 %.

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# Hicycle ELECTRIC TOOLS

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DRILLS      REAMERS • SCREW DRIVERS • NUT RUNNERS • GRINDERS • TAPPERS

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Fig. 6—Close-Up Reflection of Comic Sheet on Roll After Roll Has Been Finished. Sturdy, correct design, smooth drives, and Filmatic bearings make finishes like this possible.

grinding machine performance. The new Filmatic spindle bearing construction developed by Cincinnati Grinders Incorporated made it possible to remove as much metal with 10 h.p. on a No. 2 Centerless as formerly required 15 h.p. on an older type machine. This new bearing has three or more separate self-adjusting shoe members used to produce independent converging oil films, which develop high radial pressures, forcing the spindle into a central position.

Other types of bearings require clearance between the spindle and the bearings for an oil film. Under operating conditions with continuously changing pressures on the spindle the thickness of the oil film changed, causing the centerline of the spindle to flutter or run out. This run-out reacts on the wheel, causing it to break down. To relieve this condition the user puts on a harder wheel, with the result that the efficiency drops.

The spindle construction referred to is of such a nature that at no time can the spindle and bearing con-

tact metal-to-metal. Maintenance of an oil film is absolutely guaranteed, and the performance cited before is a concrete illustration of it. With the new type of spindle bearing construction, the No. 2 Centerless

uses a little more power running idle than the older type of bearing did, but the new machine, with a 10 h.p. motor, will remove as much metal on a given piece of work as the older type machine did with a 15 h.p. motor. This improved performance is a result of two things:

1. There is less friction loss in the spindle bearings, because the spindle does not move sideways under the load and break down the oil film, thus allowing the metal-to-metal contact which consumes so much power in friction.
2. The spindle center is so dead and smooth-running that a considerably softer and freer-cutting wheel can be used with less breakdown of the wheel.

So important has this simple change in spindle and bearing construction been that Cincinnati Grinders Incorporated has changed its complete line of grinding machines to carry this new type of construction. In fact, practically all grinding machine builders have found it neces-

# YOU COULD HAVE HEARD HIM WITHOUT THE PHONE!



1. "An emergency call for a set of boiler tubes was received after closing hours by our St. Paul warehouse."

2. "Our plant contacted the truck line and had the tubes ready by the time the truck arrived for pick-up. Delivery was effected at 8:00 o'clock the next morning, 225 miles from St. Paul."

NO wonder he was excited! Here it was after closing hours and a boiler down... and, our warehouse 225 miles away! We swung into action, loaded the necessary tubes onto a truck and delivered them the next morning. But that was an emergency, you say—what about regular orders?

Thousands of Scully customers can tell you that we operate on the basis that all orders are wanted immediately.

And no matter how large or small your order may be it will receive the same friendly attention and be shipped at once. That's Scully Service.

Why not call Scully the next time you need steel and see for yourself why Scully Service has become famous? And if you do not have a copy of our complete, handy Stock List and

Reference Book, ask for a copy. It's free, of course.

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*Distributors of Steel, Steel Products, Copper and Brass*

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# UNITED STATES STEEL

sary to modify the spindle and bearing construction used in their machines because they now realize how important it is to have this feature of the machine right.

The speed at which a grinding wheel should run for efficient grinding is still an unanswered question. Our experience leads us to believe that good, efficient grinding can be done at a surface speed of 5,000 to 6,500 feet per minute. The faster a wheel is run, the harder it appears to be, judging by the action, and the reverse is also true. This being so, it would seem to be desirable to run soft wheels fast, but unfortunately soft wheels do not have the strength to stand high speeds. If a hard wheel is run at a fast speed, it will perform as if it were still harder and you can readily see that this would make it easy to damage the work, because all of the energy applied to a wheel has to be transferred into work done

through the line of contact of the wheel with the work. If this line of contact is absorbing too much energy, the temperature at the point of contact is raised sufficiently high to materially damage the work.

Some fairly efficient grinding is done at speeds around 9,000 or 10,000 feet per minute, using rubber or elastic-bonded wheels, but the increased rate of production accomplished by this increase in speed is not generally considered sufficient to offset the disadvantages incurred, such as lack of safety, burned or checked work, and increased maintenance cost on the machine.

It was almost impossible to operate the older type grinding machines at speeds in excess of 6,500 feet, because with the size and type of spindle used, the bearing would not stand up. The new type of bearing mentioned in this article, however, has such a large margin of safety

ANOTHER ITEM IN THE  
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FOR FILING • TENSILE AT 100° F FOR 12 HOURS, OR HEAT TO WHITE DULL BLUE  
FOR GRINDING • TEMPER AT 300° F • LAMEL STRIPS GAUGE

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that no particular trouble is incur-  
red even when the speed is doubled.  
Now that it can be done, however,  
the urgent demand for a higher  
wheel speed seems to have vanished.  
We find much to indicate that  
slower speeds are desirable when the  
finest quality of finish and accuracy  
are needed. There is usually a mate-  
rial improvement in the quality of  
finish when the wheel speed is low-  
ered to the point where a live spark  
is no longer generated. This is the  
point at which the grinding chip  
comes off cold enough to leave what  
we would call a clean, smooth cut.  
The speed at which the sparking  
ceases is usually between 2,500 and  
3,200 feet. This is, of course, based  
on using a coolant or grinding com-  
pound. We have been able to pro-  
duce, at these low grinding speeds,  
finishes that approach those obtained  
by honing or lapping.

Good finishes can be produced by  
grinding, lapping, honing and polish-  
ing, all through the use of one form  
or another of abrasive. There is con-  
siderable difference of opinion as to  
just what each one of these opera-  
tions is, so we will not attempt to  
give you an accurate definition but  
will name them and discuss them  
according to my own impression as  
to the differentiating features.

The "lapping-in" of a surface with  
abrasive is one of the earliest meth-  
ods of generating an accurate sur-  
face. It is done by rubbing two sur-  
faces together with loose abrasive  
material between them, each surface  
in turn contacting the high points on  
the other surface. The material is  
removed at the contact points, grad-  
ually increasing the area of contact  
and if the operation is carried on for  
a sufficient length of time, the com-  
plete surface of one piece would be

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### RED STREAK

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MUCH MORE CUTTING...MUCH LESS SHARPENING

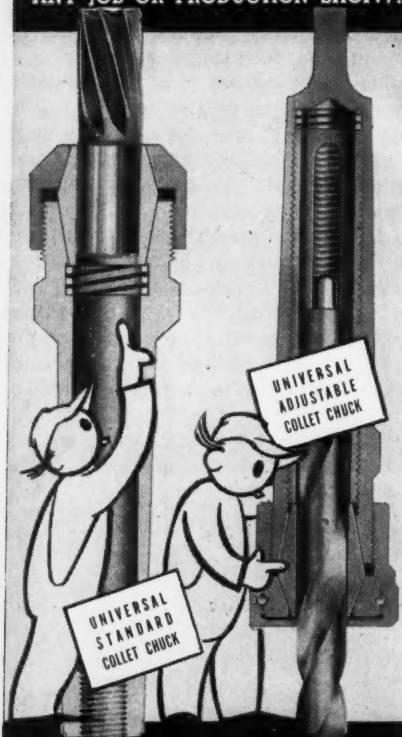


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METAL CUTTING  
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All Universal Collet Chucks have ground threads and handy wrench grip on shanks. Adjustable chucks, designed for single purpose drilling, adjust within .002". Standard chucks are ideal for holding end mills, keyway cutters and drills. Write for complete facts.

**UNIVERSAL**  
Engineering Company  
Frankenmuth, Mich.

in contact with the complete surface of the other piece. The word "lap" was generally considered to refer to the action of one surface lapping over another surface.

The earliest form of lapping did not necessarily start with either surface being accurate; generally, the abrasive would remove material from both the work and the lap. Later it was found that by starting with one surface fairly accurate geometrically and of a material such as would hold a loose abrasive to advantage, it was possible to lap the work faster. A natural development was a lap consisting of a specially prepared plate, held in a machine which floated the work to the lap with a variable mechanical motion of such a nature as to accomplish the universal type of contact. Later it was realized that the lapping plate and abrasive could be done away with and a rigid abrasive in the form of a wheel could be used, provided the wheel could be mechanically dressed to an accurate, smooth surface equivalent to the lapping plate. In this form, lapping today is generally known as honing.

Honing, when performed with equipment designed to make possible certain new multiple movements in all directions, with a pressure control and with certain types of coolant, is now known as "Superfinishing."

The term "polishing" is applied to the type of operation in which a loose or semi-rigid abrasive is applied to the work with a cushion contact so that the abrasive operates on the work in the low spots as well as the high spots, and thereby smooths the entire surface although not sufficiently to materially affect the general geometrical shape. This covers briefly the general field of removing metal by the use of abrasives.

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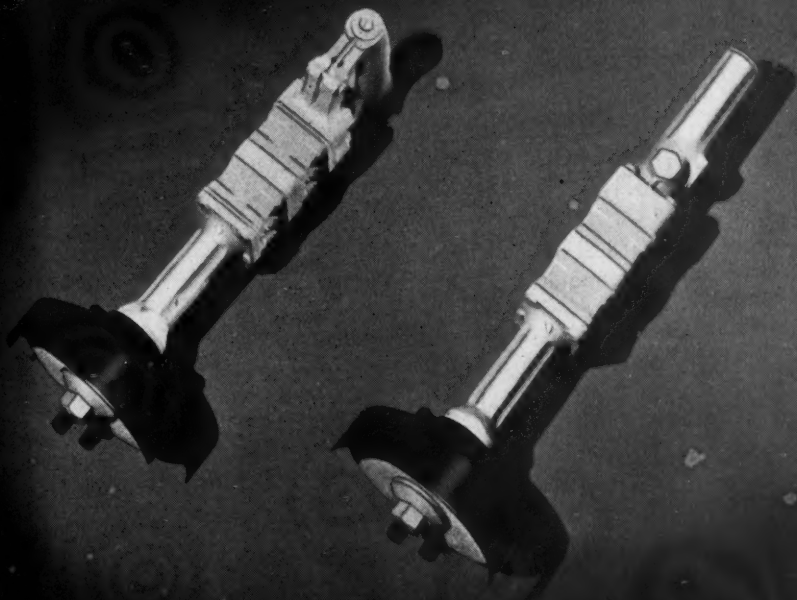
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April, 1940

*The*  
**D-100 POWERPLUS** Grinder  
*for 6" wheels  
weighs only 9 3/4 lbs!*



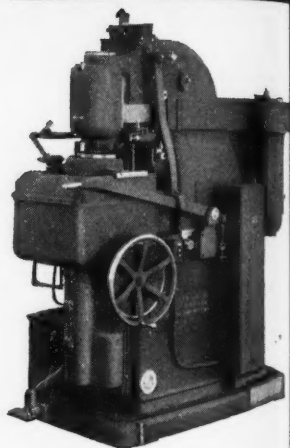
*(More Power than you can use)*  
**ROTOR** TOOL  
COMPANY

CLEVELAND, OHIO

# WALKER

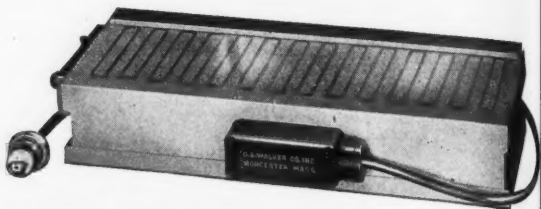
## IMPROVED ROTARY SURFACE GRINDER

Raising or lowering wheel head automatically starts or stops the table and magnetizes or demagnetizes 12" magnetic chuck. Other features include wheel head locking device and adjustment of upper portion of column for grinding saws, cutters, etc., having hubs up to 6" diameter. Six table speeds are available and a foot brake facilitates quick stopping of table.



## MAGNETIC CHUCKS

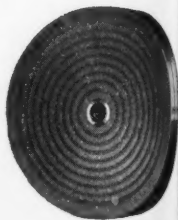
Right—No. 618 Standard Type Rectangular Magnetic Chuck. Available in sizes 4 x 8 to 30 x 96.



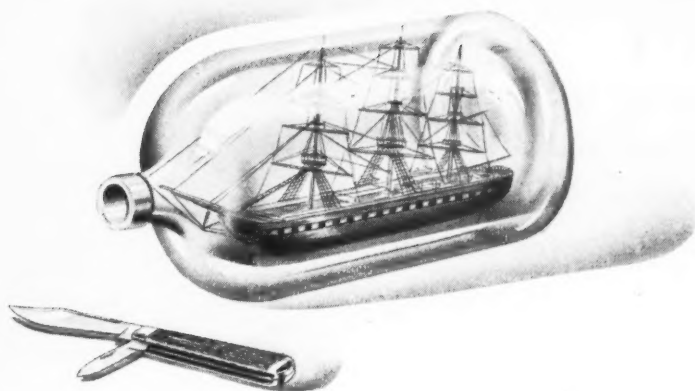
## STANDARD ROTARY CHUCKS 6" TO 36" DIAMETER

Style D (right) for thin, small work, as well as for general grinding. Style B (left) is ideal for work of average size and thickness. Four standard styles, all interchangeable.

Ask for Circular W3.



O. S. WALKER COMPANY, INC.  
WORCESTER MASS.



## THE SPIRIT OF JACKKNIFE JOE...

Old Joe could whittle the durndest things out of any old piece of wood that came handy. Ship model, whistling boy, bird in the cage. Name it. Joe could whittle it.

Production en masse was never in Ole Joe's category. Cost of production never worried him. Time and labor was something people took delight in.

Successful business 1940 style has come a far way from Jackknife Joe's philosophy of "sure I kin make it." Today, it asks itself: "Can we make it so that we can sell it at a profit?"

Yet there are plants that seek these profits with methods that disclose a realistic kinship to Jackknife Joe.

With lathes for instance that still run as good as ever, yet as incapable (as the knife of Jackknife Joe) of making a contribution to profits.

Ever consider the fact that new improved LeBlond Lathes are being built because your competitors are demanding them? In a free country, too, where the same tools are available to all.

**THE R. K. LeBLOND MACHINE TOOL CO.**

CINCINNATI, OHIO

1940 STEP DOWN COSTS *with a* **LeBLOND** STEP UP PROFITS

## Presenting Some of the Tools and Methods Used in the Inspection of Parts for Use in Diesel-Electric Locomotives

ONLY six years ago millions of Americans gathered along the railway right-of-way to watch the first Diesel - Electric - powered train glide past on its history-making and schedule-shattering run from Denver to Chicago. No doubt there were questions in the minds of many of us as to what takes place behind the scenes; we wondered what new technique has been developed that makes it possible for this new engine to maintain high speeds continuously for a thousand miles or more.

The high efficiency of the Diesel-electric locomotive can be credited to these three factors: (1) engineering principles, (2) design of parts, and (3) assurance of quality. Responsibility for quality rests squarely on the shoulders of the inspection department, and it is with some of the fine tools used in inspection that this article deals.

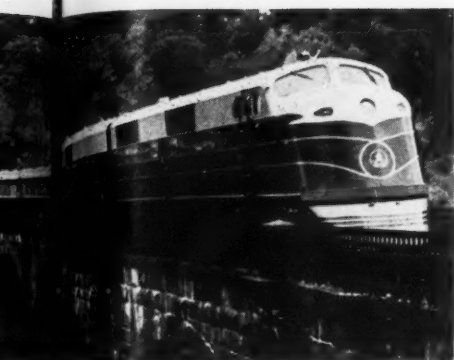
The manufacturing organization of the Electro-Motive Corporation consists of some 2,500 men, including representatives of nearly every country on the face of the globe. Inasmuch as it is rare for any two men to agree perfectly on the matters of



## Ensuring Quality Locomotive

quality and finish, the inspection department has to be the judge. With no pre-arranged code of standards to work by, it has been necessary for the department to develop its own standards, striking a balance that would meet both the quality demands of the engineering department and the production demands of the manufacturing department.

The first rule of the inspection department is that no piece of work shall be picked up for inspection unless it presents a finished appearance and unless all edges and corners have been "burred" so that the parts can be handled without danger of cutting the hands. The inspectors are taught that, in order to make a good assembly, each part must be sound in itself; thus each piece is carefully looked over for possible flaws before the inspector proceeds with checking the dimensions against the specifica-



# Quality in Diesel Production

By H. C. URBAUER

Head of Diesel Engine Inspection,  
Electro-Motive Corporation,  
LaGrange, Ill.

The inspection problems are many and varied, but it is the opinion of the writer that best results can be obtained from the reader's standpoint by confining this article to a discussion of two of the major inspection tasks — gears and threads.

All gears used in the Diesel-electric locomotive, both spur and helical, are cut in hobbing machines. If, then, we would produce quiet-running gears, if we would make gears with the good tooth bearing surface which is the first requisite to long gear life, we must know positively that the cutter is correctly made to start with and that, if it has been sharpened, the shape has not been altered or impaired by the man who sharpened it. It is therefore the responsibility of the inspection department to know that a hob is correctly made before it is mounted in the machine.

The hob is first checked over to make sure that the contour of each tooth is correct. In the hobbing machine, ordinarily one revolution of a single-thread hob finishes one gear tooth complete; thus if the hob has 12 teeth or "gashes" in its circumference, a complete gear tooth is pro-

ions and drawings.

All bearings must be finished glass-smooth, regardless of whether they are on a crankshaft or on the least important shaft in the assembly. Should a scratch no deeper than a pin-scratch be found on the crankshaft journal, the scratch must be wiped out before the shaft can be passed for assembly. It is not impossible to find small irregularities in the faces of copper strips that have been rolled in due to the use of dirty lubricant in the rolling process, in consequence of which the strips are rejected if the copper is to be used anywhere in the manufacture of electrical parts.

Not only is the completed locomotive produced at the LaGrange, Illinois, plant, but also all major accessories such as the Diesel engine, electric generators, electric motors, and electrical transmission stations.

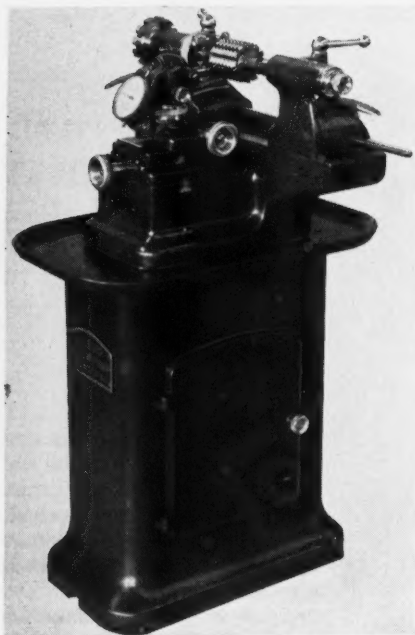


Fig. 1—Hob-checking machine used to check profiles of hob teeth, lead of thread in the hob, and concentricity of teeth with the bore. Any variations in tooth form are detected by a thin-edged finding finger from which the variations are transmitted to the indicator needle, and translated into ten-thousandths inch measurements on the dial.

duced by the 12 successive cuts. If there is any variation in the shapes of these 12 teeth, the result will be small flat or low spots in the bearing surfaces of the teeth.

The Universal Hob and Cutter Checking Machine used to check over the hob teeth is shown in Fig. 1.

In Fig. 2 is shown the machine used to check all gear tooth profiles. Tolerance is 0.0005 in. for profile variation or for any low spot that may have crept in in spite of the utmost care that can be exercised in check-



Fig. 2—Instrument for checking the involute profile, or gear tooth face contour. A finding finger locates any minute low or flat spot, as well as all the irregularities in the contour as a whole, registering them on the indicator dial.

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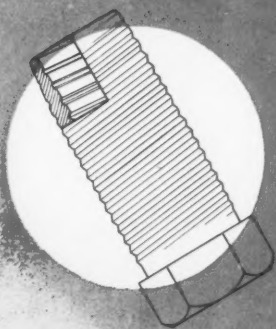
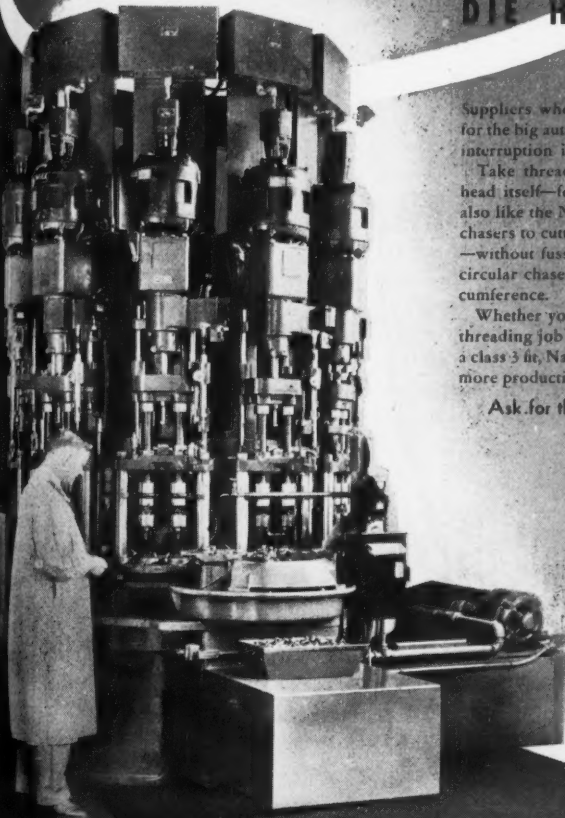
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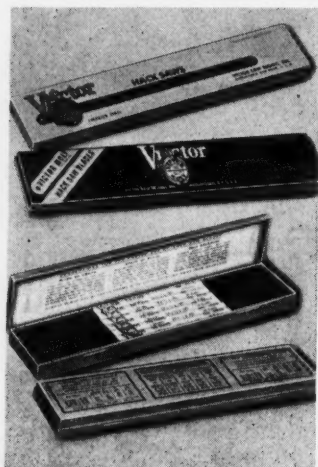
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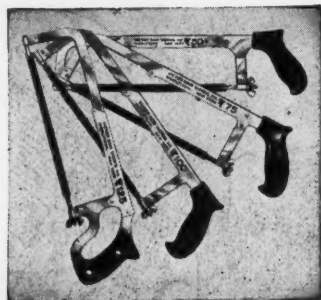
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same as for the gears with smaller teeth.

With the testing machine shown in Fig. 3 we check the spacing of the gear teeth, and determine whether or not each tooth is of the proper size and shape so that the teeth will "roll" correctly with the teeth of the

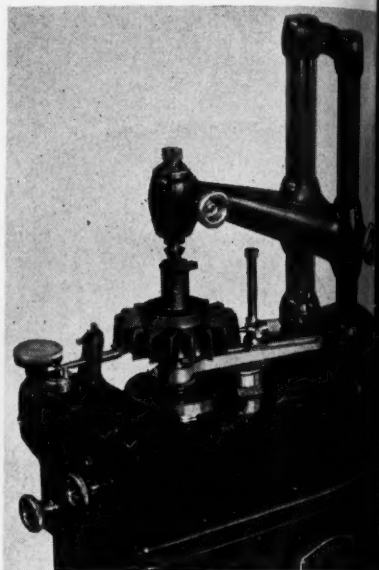


Fig. 3—With a slightly different set-up, the machine shown in Fig. 2 can be used, as shown here, to check normal pitch and tooth spacing.

mating gear. If any one of the teeth is not correctly made, it will bind and friction will be felt when the gears are rolled together. Quiet, smooth gear performance is dependent upon these two tooth qualities.

When a Diesel locomotive is operating at speeds around 100 miles per hour, the driven gear on the axle may be revolving at speeds upwards of 1,000 r.p.m. At that speed smooth and quiet operation is imperative because if the gears are noisy, the noise



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**A**LL of us here knew the properties of **MO-MAX** Molybdenum Tungsten High Speed Steel, yet we did nothing about it until last year. Now our records prove that high speed tools made of **MO-MAX** are twenty per cent more efficient. That's a big saving in our production costs. We could have made that saving five years sooner if we had applied our knowledge. Certainly somebody here should have seen to it that we made some tests long before we did. Perhaps I should have done so myself. Anyway I don't want this organization to overlook any opportunities like that again. We can't pay high salaries for what people know, but we can and will pay well for what people do.

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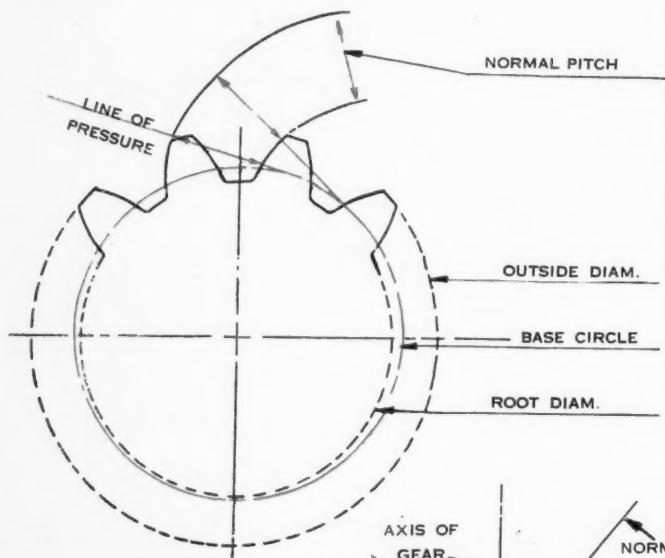
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is amplified in ratio to the speed. Thus the smoothness of operation is determined by the care and pains

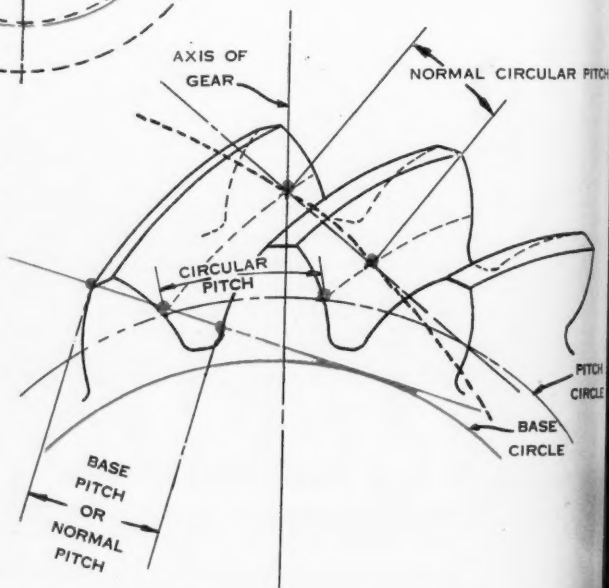
objective in the spur gear is the perfect normal tooth pitch, but in the helical gear we have to contend with

still another factor—base normal pitch. In other words; the helical gear has two normal pitches and the normal base pitch as illustrated in Fig. 5. Each of these factors is important and each tooth must be checked individually for both.

The illustration Fig. 6 shows the



Figs. 4 and 5—A comparative study showing the normal pitch in a spur gear and the three pitches common to helical gears. The extra effort and cost involved in the production of helical gears is rewarded by silent, smooth gear operation and in extra gear life.



taken in checking the gear teeth for the qualities referred to, and in the elimination of the unfit.

The drawings Fig. 4 and 5 are presented in an effort to illustrate the difference in conditions between a spur gear and a helical gear. The

machine used to inspect helical gears for the accuracy of the helix angle of tooth curve angle from end to end

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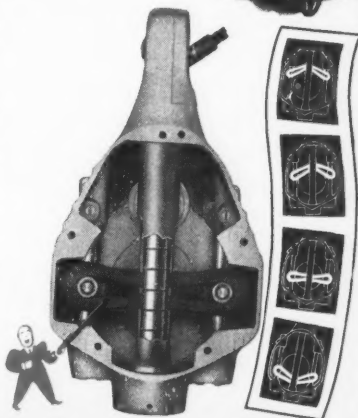


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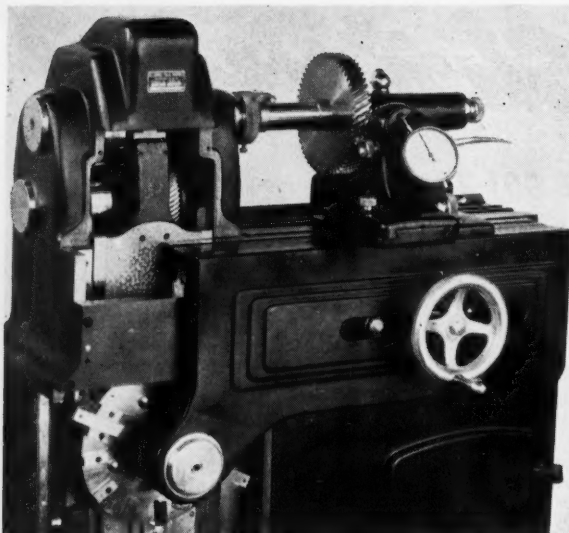


Fig. 6 — Helical lead is checked with the aid of this machine. Any variation in helices is ferreted out with the same precision that is employed in preceding tooth factors.

feat the very purpose for which the helical gears were selected.

Until quite recently a great deal of trouble had been experienced in obtaining accurate inspection on screw threads. We make a number of different sizes of screws which must be

of the tooth. Any differences, however slight, in the pitch helices of mating gears on parallel shafts must be avoided if full tooth bearing efficiency and quietness of operation are to be obtained.

In inspecting spur gears it is most important to know that the tooth contour, or tooth curve, is correct because through the tooth bearing the mating gear receives its motion, but in inspecting helical gears three checks must be made lest an accumulation of errors creep in to produce a noisy gear assembly and thus de-

accurate on the pitch diameters within 0.001 in. These screws are made from very tough and hard heat treated material, and when we began to make them the production engineer said, "It can't be done." But we are doing it, turning out screws every day to tolerances closer than a class five thread.

However, this job has put the inspection department in rather a difficult position, due to the fact that this department has had to act as umpire in determining which pieces are and which are not within the

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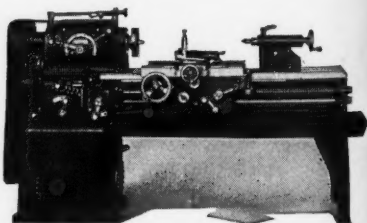
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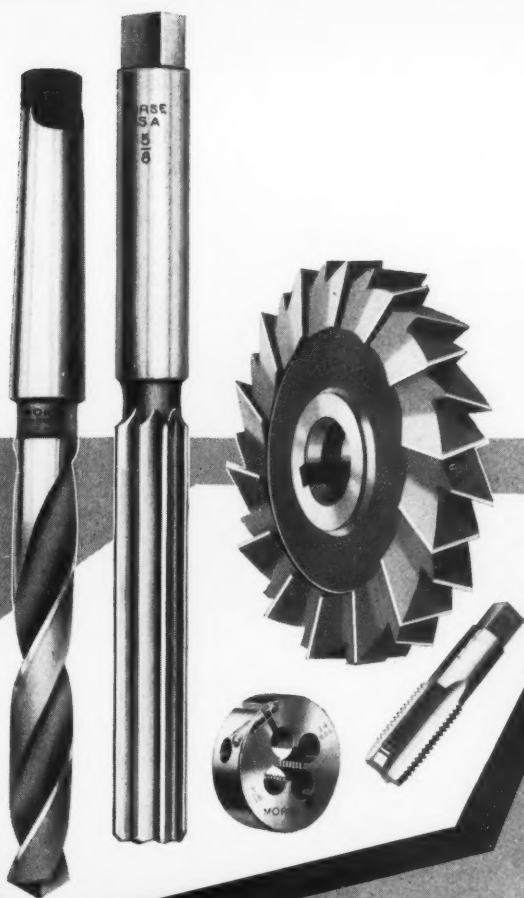
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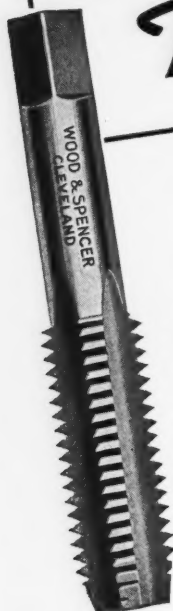
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prescribed limits. The usual method of measuring screw threads leaves too much to the human element; this is, too much depends on a light or heavy touch in handling the measuring instruments.

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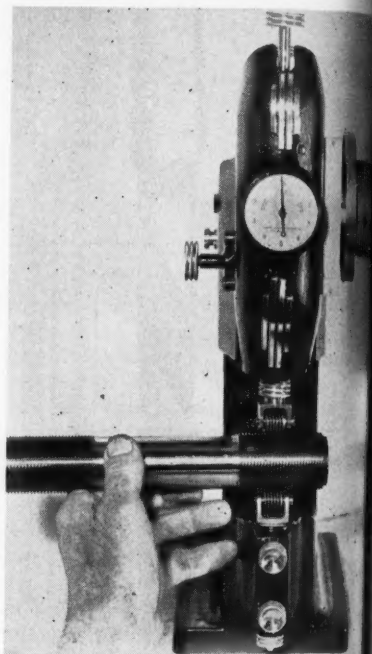


Fig. 7—Thread pitch micrometer designed to duplicate the working conditions under which the screw or stud will be used; thus the indicator gives a reading for the average pitch diameter, and not for a single point at which a low spot might occur.

system of measuring screw threads. The illustration Fig. 7 shows a machine which was designed and built by an engineer who spent more than ten years in research on threads and in the development of this instrument after having spent six years as a thread-producing specialist.

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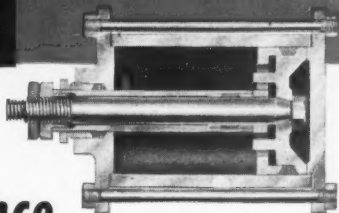
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It is his theory that the three-wire method of measuring pitch diameters, or a method by which very small contact points of an instrument are applied to the pitch line, may be only what he terms "capricious approximations" to the real pitch diameter, and that to measure the pitch diameter accurately, upon the reading graduations of the instrument, a duplication of the condition that will be produced by the contact of the screw thread with the thread in the hole for which the screw is intended is necessary.

And we have found that his reasoning is correct. For example, on a  $\frac{3}{4}$ -in. diameter, 10-pitch die-cut thread we found the pitch diameter to be actually 0.0013 in. larger than had been shown when the thread was measured by the single thin contact point method. It was apparent that in measuring by the latter method,

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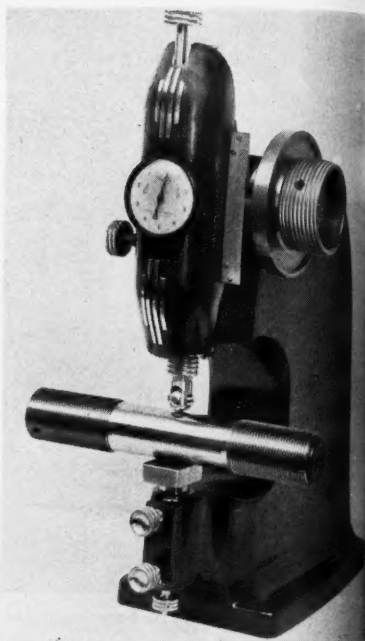


Fig. 8—Instrument shown in Fig. 7 as used for checking plain work diameters. The spindle is serrated to prevent possible interference from dust. Spindle contact is made with ball-shaped contact.

the points had found low spots on none-too-smooth cut.

As shown in Fig. 7, the instrument is being used to check the pitch diameter of the thread on a stud. With the thread on the stud engaged with corresponding threads on opposite sides, it is evident that a duplication of the actual work condition is maintained.

In Fig. 8 the same instrument is shown in use for checking the diameter of a plain workpiece. To adapt the instrument for plain work checking or from one thread pitch to another, the change can be made in less than 30 seconds.

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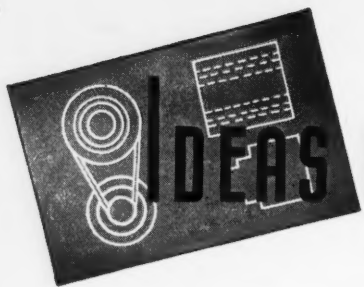
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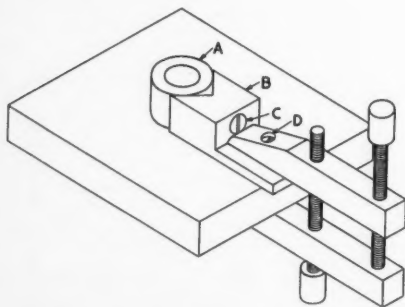


# IDEAS FROM READERS

## Handy Hole-Spacing Device

By PETER L. BUDWITZ

**T**HE simple device shown in the illustration was designed to enable the toolmaker to lay out and bore holes accurately in jig plates, dies, and similar work. The device consists of a hardened and ground drill bush-



Drawing of Handy Hole-Spacing Device

ing, **A**, which is fastened to the holder **B** by means of the screw **C**. The holder **B**, in turn, is fastened with a screw to one of the jaws of a standard parallel clamp as shown at **D**. The device can quickly be located and anchored in place, providing a bushing for accurate drilling.

In use, all hole locations are calculated from the outside diameter of the drill bushing **A**, using the usual

size blocks, micrometers, and other tools. The diameter of the drill bushing should be a size that can easily be divided so as to simplify hole-spacing calculations. The flexibility and range of the device can be increased by the use of various sizes of "slip" bushings which can be inserted into the main bushing.

## Fixture for Internal Keyseating

By L. KASPER

**T**HE detail indicated as Fig. 4 of the accompanying drawing illustrates a workpiece with two opposing radial keyseats of the type that is produced by the use of a Woodruff keyway cutter. Having a number of pieces to be machined in a similar manner, the fixture described here was designed.

To hold the workpiece **A**, it is clamped in the block **C**, which in turn is dovetailed into the support **D**. The support carries a barrel cam **E** which is fitted to the shaft **F**, and the end of shaft **F** carries a gear, **G**, which meshes with a similar gear, **H**, which is anchored to the end of the longitudinal feed screw of the milling machine.

In the underside of block **C** is a groove in which is carried a roller

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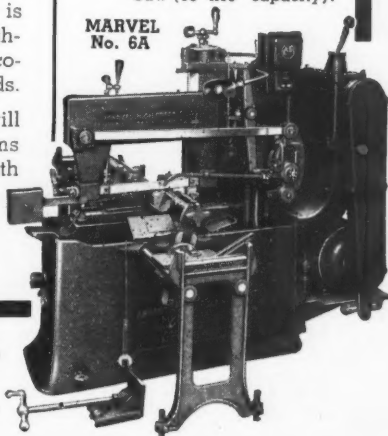
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- 6A. **MARVEL No. 6A—**Automatic Production Saw with the Automatic Bar Push-up (6" x 6" capacity).
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9. **MARVEL No. 9—**Heavy Duty High Speed Saw (10" x 10" capacity).
- 9A. **MARVEL No. 9A—**Automatic Production Saw with Heavy Duty Bar Push-up (10" x 10" capacity).
18. **MARVEL No. 18—**"Giant" Hydraulic Hack Saw (18" x 18" capacity).

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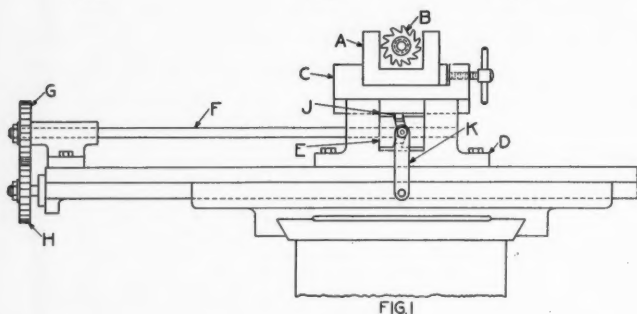
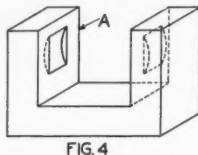
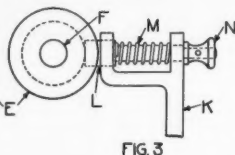
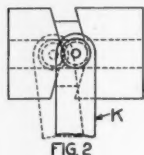
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which fits into a groove in the cam **E**. The usual feed-engaging lever of the milling machine is replaced with a special lever, **K**, details of which are shown in Fig. 2 and 3. As shown in Fig. 3, the upper end of lever **K** is forked to provide for carrying the pin

and the table is locked in position so that, when the feed gear is engaged, the screw will rotate without moving the table. The workpiece is then clamped in block **C** as shown in Fig. 1, the pin **L** is withdrawn from the groove of cam **E**, and the lever **K** is moved to the left to the position indicated by the dotted outline in the drawing Fig. 2.



Drawing Illustrating Set-Up for Performing Internal Keyseating Operation on Workpiece of the Type Shown at **A**, Fig. 4.

**L**, which rides in the groove in cam **E**. A spring, **M**, serves to keep the pin **L** engaged in cam **E** while the knob **N** is used to disengage the pin from the cam groove.

To operate, the nut of the longitudinal feed screw is first removed

reciprocated with the result that the end surfaces of the workpiece are alternately fed into the cutter **B**.

When cam **E** has completed a half turn, the groove in the cam is again in position to receive the pin **L**. As pin **L** drops into the groove in the

The subsequent action causes the feed gears to engage, thereby rotating the feed screw. The pin **L** is left in position as shown in Fig. 3. As shaft **F** revolves, motion is imparted to the cam **E** through gears **G** and **H**. As cam **E** revolves, block **C** is

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cam, the lever **K** is moved to the right, disengaging the feed screw so that the workpiece can be removed and a new piece inserted.

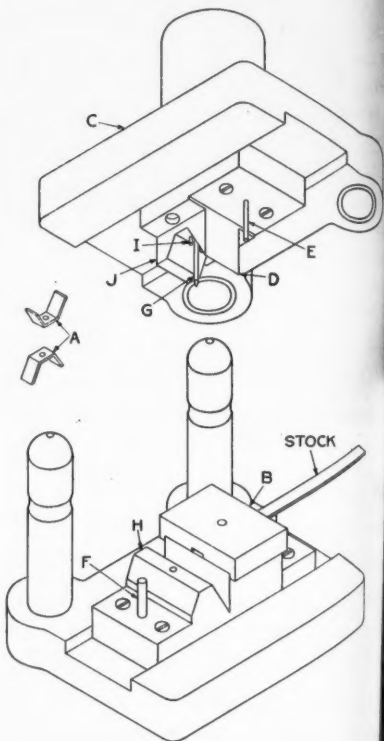
## Tools for Shearing, Piercing, and Forming Spring Brass Stock

By CHAS. H. WILLEY

THE illustration indicated at **A** in the accompanying drawing shows the design of a small brass clip that is used to hold the glass in a meter frame. The clip is made from 1/32-in. spring brass,  $\frac{1}{16}$  in. wide, which is received in coils. Having need for large quantities of these clips, the simple tools shown in the illustration were devised. With these tools it was possible to use continuous hand feed, resulting in a production of

4,000 finished pieces per hour.

The lower member of the die consists essentially of a forming anvil **H**, the guide plate and stripper **B**, and stop pin **F**. The upper member is provided with a block, **J**, having a shearing edge, **D**, and designed to



Drawing Illustrating Design of Tools for Forming, Piercing, and Shearing Part from Spring Brass Stock

fit the anvil **H** of the lower member. It also carries the punch **E**, pilot pin **G**, and spring-operated pins **I**.

In operation, the stock is fed through the guide plate and stripper **B** until the leading end of the strip extends slightly beyond the guide. As the press ram descends, the stock is

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cut by the shear edge **D** and the piece is then pierced by the punch **E**. As the ram rises, the stock is fed in to the stop pin **F**, and as the ram descends again the pilot pin **G**, which is tapered, enters the pierced hole and positions the stock for the next piece. As the ram continues downward, the piece is formed and sheared on the anvil **H**, from which it is blown by an air-jet.

The two spring-operated pins **I** in the upper member are provided to strip the workpiece from the block **J** onto the forming anvil **H** after the piece has been formed.

## Swing-Type Thread Chasing Tool Holder

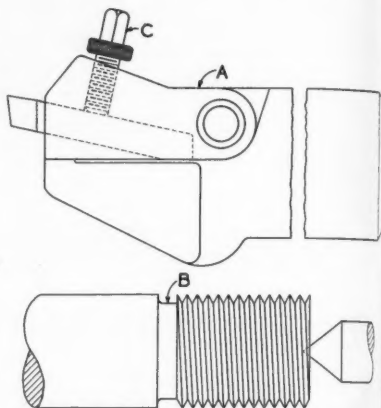
By F. J. WILHELM

**W**HEN threading work on the lathe with the conventional type of tool holder and a single-point tool, the chasing tool must be "backed out" from the work at the completion of each cut. With a tool holder of the type shown in the illustration, this backing out procedure can be eliminated.

The tool holder is designed with a hinged section, **A**, which enables the chasing tool to be swung upward at the end of each cutting operation in order to clear the threads when re-

turning the tool to its starting position. A knurled screw, **C**, not only provides means for clamping the tool, but also serves as a handle for gripping in order to raise the section.

To use, the work is set up in the



Drawing Illustrating Design of Swing-Type Threading Tool Holder

lathe, the speeds and feeds are determined, and a toolbit is clamped in the toolholder. The tool is then fed into the work in the usual manner. When the tool reaches the end of the cut, at the necked portion of the work indicated at **B**, the hinged section of the holder is swung upward so that the tool will clear the work and the carriage is then returned to

## STAPLES Solid Carboly-Tipped Reamers



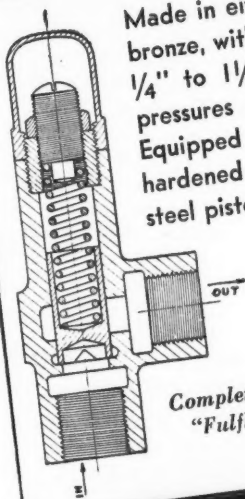
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the starting point. The tool is now dropped back into cutting position and fed in a couple of thousands of an inch by means of the compound or crossfeed screw.

The use of the swing-type tool holder simplifies the threading operation and saves time, due to the fact that it is not necessary to withdraw the tool at the end of the cut and set it up to a given point again before the cut can be repeated.

ply a fairly rugged type of canning plant machine, a flat surface port valve was believed unsatisfactory for

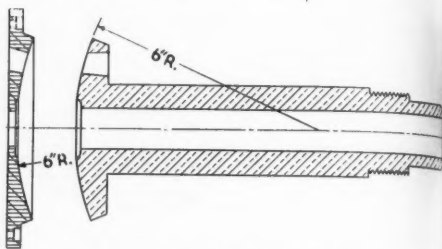


Fig. 1—Drawing of Valve with Spherical Mating Faces

## Tools for Turning and Boring Spherical Valve Seats

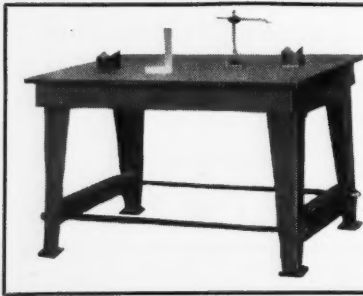
By STANLEY PORRIT

**I**N the designing of a machine for food processing, one of the problems encountered was the inclusion of a rotating port valve that would be both steam- and vacuum-tight and at the same time be impervious to corrosion from the juices of the food products as well as non-rusting when the machine was shut down between seasons. The stationary half of the valve was to be made of bronze and the revolving half of Bakelite.

Because the machine under construction could not be classed as a precision machine, but rather as sim-

ple the following reasons: (1) because of the difficulty of making perfectly flat valve faces  $4\frac{1}{2}$  in. in diameter that would stay flat and be steam- and vacuum-tight at temperatures around 300 deg. F., and (2) because in loading and unloading the 15 heads of the machine, the head to which the Bakelite or moving half of the valve is attached would be subjected to considerable jar and side thrust; thus any looseness of the spindle upon which the head revolves would allow the valve faces to separate on the side to which pressure was applied, allowing the steam to escape and losing vacuum.

The valve was therefore designed with the mating face spherical, as shown in Fig. 1, and the spindle upon



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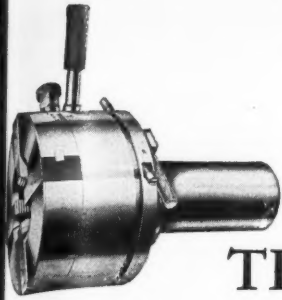
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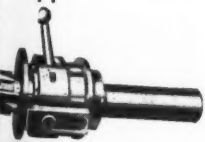
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MATERIAL Soft Steel		MACHINE Cincinnati
REMOVAL		WHEEL SPEED
LIMITS		
REMARKS	Best wheel ever used on cold rolled steel shafts.	

OPERATION Cylindrical		WHEEL 1860/E-LBSE
PART Pinion shafts		SIZE 18 x 3-1/2 x 19"
MATERIAL Hardened steel		MACHINE Norton
REMOVAL .020 to .030"		WHEEL SPEED Standard
LIMITS		
REMARKS	Satisfactory - the best wheel they have had on this job. Gave them 10 pieces more per dressing.	

OPERATION Snagging		WHEEL 16/2-R4T-H
PART Castings		SIZE 20 x 1½ x 10"
MATERIAL Hard Malleable Iron		MACHINE Floor Stand
REMOVAL		WHEEL SPEED 1800 r.p.m.
LIMITS		
REMARKS	Ground 17½ tons of castings per wheel against competitor's average of 14. Wheel life 51-2/3 hrs. against 40 for competing wheel.	

OPERATION		WHEEL 3714/
PART Bath tubs, m		SIZE 6 x 24"
MATERIAL Cast Iron		MACHINE Po
REMOVAL Varias		WHEEL SPEED
LIMITS		
REMARKS	Best wheel in operation	

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MACHINE Robinson Automatic  
WHEEL SPEED

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makes.

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MATERIAL Stellite  
REMOVAL  
LIMITS  
REMARKS

WHEEL 60-R5T  
SIZE 6 x 2 x 5/8" B  
MACHINE Milwaukee  
WHEEL SPEED 2700 r.p.m.

Customer has tried for years to get a wheel which will grind cutters dry without checking. This wheel was very successful both for cut and life.

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LIMITS  
REMARKS

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SIZE 14 x 1/8 x 1"  
MACHINE Tabor  
WHEEL SPEED 3800 r.p.m.

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**NORTON ABRASIVES**

which the head revolves was given 1/32 in. clearance with the intention that it should be held loosely at the

ance slightly the force of the steam pressure on the surface of the valve and so keep it steam-tight, at the

same time eliminating trouble caused by expansion and contraction of the large mass of metal in the heads.

In order to ensure economy and the production of convex and concave surfaces which could be assembled together

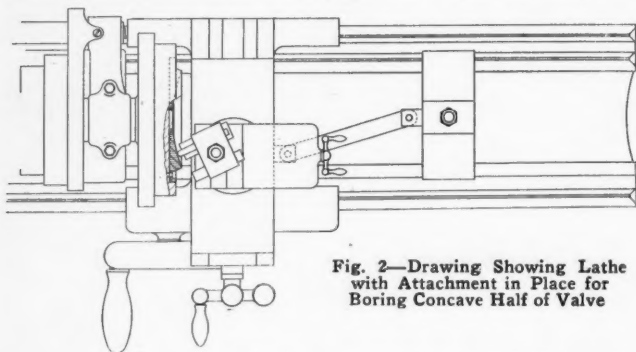
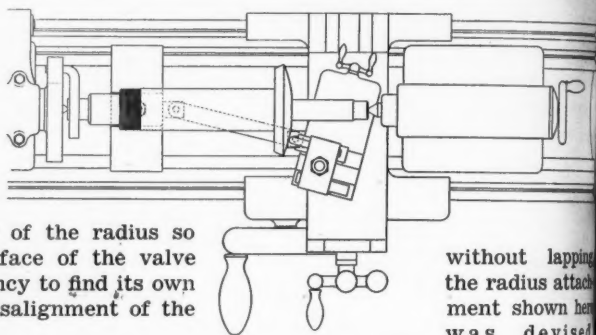


Fig. 2—Drawing Showing Lathe with Attachment in Place for Boring Concave Half of Valve

Fig. 3—Drawing Illustrating Set-Up for Turning Bronze Half of Valve



approximate center of the radius so that the spherical face of the valve would have a tendency to find its own seat despite any misalignment of the central spindle.

When subjected to side pressure, the valve faces are free to move sideways until the central spindle contacts the side of the bearing. The two faces of the valve are held in contact by means of a large spring which can be adjusted to over-bal-

without lapping the radius attachment shown here was devised

The drawing Fig. 2 is a plan view of a lathe with the attachment in place for boring the concave half of the valve. If all the gibs are taken up to a snug fit, the tool will travel across the spherical surface without backlash, jerking, or vibration. The

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carriage rack gear should be disengaged, if possible.

The drawing Fig. 3 shows the set-up for turning the bronze half of the valve. In this set-up the work is sup-

set up is apparent when it is considered that no time is required for setting the tool to the required radius, since that radius is fixed by the distance between the holes in the

link. In addition, the same link is used for both convex and concave work, thus assuring exact duplication of mating surfaces. Drawing Fig. 4 gives details of the simple parts required for the fixture

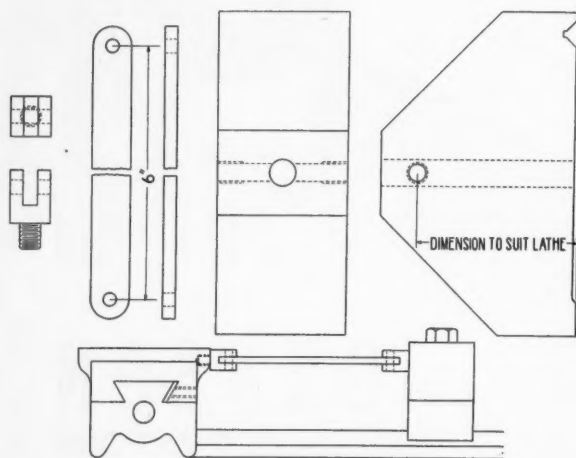


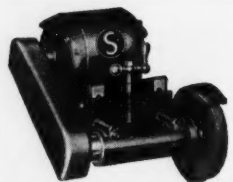
Fig. 4—Detail Drawing of Parts Required for Valve Seat Fixture

ported by the centers. By knocking out one of the dowel pins holding the radius link, or loosening the bolt that holds the tailstock, freedom of movement of the carriage and cross slide is restored and the facing, turning, and chamfering operations can be performed in the lathe.

The speed at which the job can be

a double - page sectional photograph showing the various internal and external parts comprising the assembly of the Wright electric hoist is included. Also contained in the catalog are complete specifications as well as diagrams and dimensional tables for the various types of Wright electric hoists.

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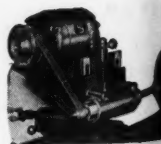
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to be held at Dallas, Texas  
April 22, 23 and 24, 1940

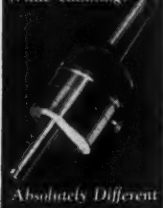
**T**HE thirty-fifth Triple Convention of the Southern Supply and Machinery Distributors' Association, National Supply and Machinery Distributors' Association and American Supply and Machinery Manufacturers' Association will be held at Dallas, Texas, the three days of April 22, 23, and 24, 1940. From the preparations that are being made it is evident that the forthcoming convention will be one of the most fruitful, as well as one of the most enjoyable, ever held by these associations.

The highly satisfactory results and enjoyable experiences which developed out of last year's meeting, which was held in the form of a cruise to Bermuda, led to a decision to duplicate the plan, as far as possible, in

arranging the trip to Dallas. Thomas Cook & Son, who had charge of the arrangements for the Bermuda trip, have again been placed in charge of transportation and have arranged a "land cruise" by rail to Dallas, using the Pennsylvania, Frisco, and Katy Lines. Trains connecting with these lines at principal cities along the route will enable members from more distant points to join the land-cruise train.

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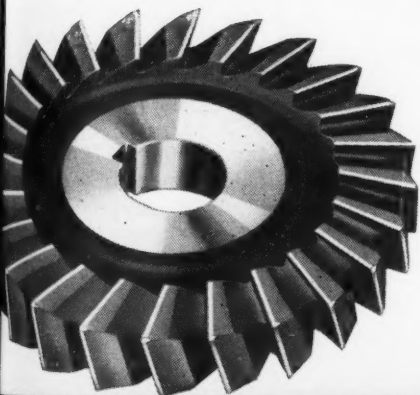
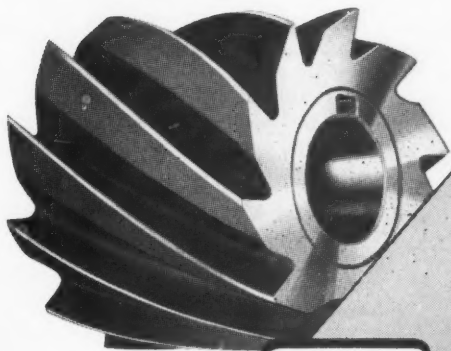
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## Over the Editor's Desk

### April

THE month of April is a month of particular significance to America. It was the "18th of April, '75," that Paul Revere galloped off on his historic ride and thus precipitated the war of the American Revolution; it was the 12th of April, 1861, that the first shot of the American Civil War was fired; it was the 20th of April, 1898, that President McKinley signed an ultimatum which amounted to a declaration of war with Spain; it was April 6, 1917, that the United States entered the war against Germany.

And so April is of peculiar importance to Americans in general and to metal workers and technicians in particular, because guns are made of metal, and the advancements which have made modern warfare, as we know it, possible are a direct result of the activities of the modern scientist—particularly the metallurgist.

The first cannon, made some time previous to the twelfth century, were of wood wrapped with folds of linen and held together with iron hoops. Iron workers of the twelfth century devised cannon of wrought iron, the first cannon being built up of wrought iron staves and held together with wrought iron rings which were either driven or shrunk on. In or about 1370 the first cannon of cast bronze were made and cast bronze guns were in use up until the time of the Civil War.

Cast iron cannon came into use in the time of Henry VIII, or somewhere between 1521 and 1540, and it was also during Henry VIII's reign that rifling was introduced to spin the projectile and make possible a little better aim. In 1739 the first gun was bored from solid metal, but guns made in this manner burst so frequently that their use was discouraged and the use of the cast iron and bronze cannon was resumed.

In 1855 the idea of winding cannon barrels with wire was first developed and wire-wound guns were used in the American Civil War. During that period the first "built-up" guns also appeared and between that time and the World War the wire-wound guns were abandoned for the built-up type. The built-up type consists of a barrel with one or more extra cylinders shrunk in place near the breech to provide the necessary strength to prevent bursting.

More recent ordnance is built up from forged steel containing 2½ to 3 per cent nickel, tempered and drawn to provide the maximum of strength. At the present time our large guns are centrifugally cast from steel to close specifications. After casting, the barrels are normalized and annealed, rough machined, then heated again, quenched and drawn.

It is apparent that, today, the success of a battle depends to a very large degree upon the skill of the man in the laboratory.

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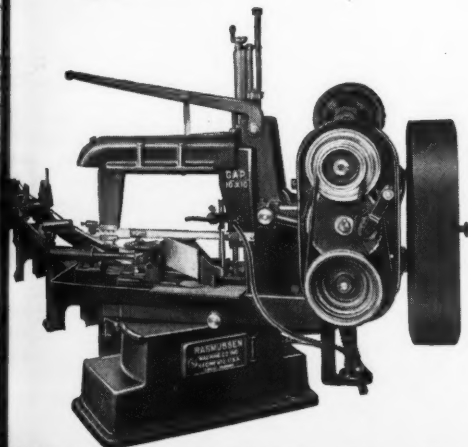
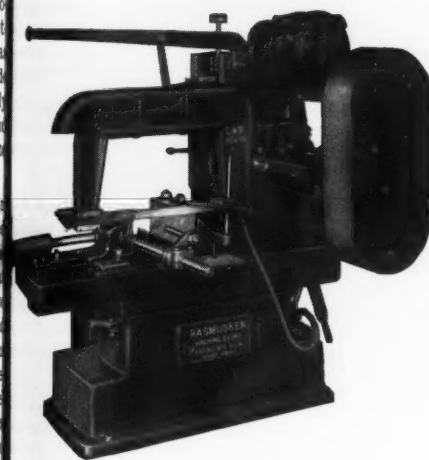
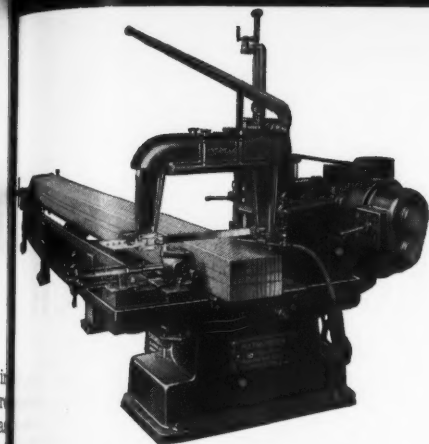
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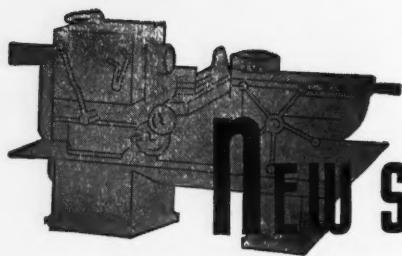
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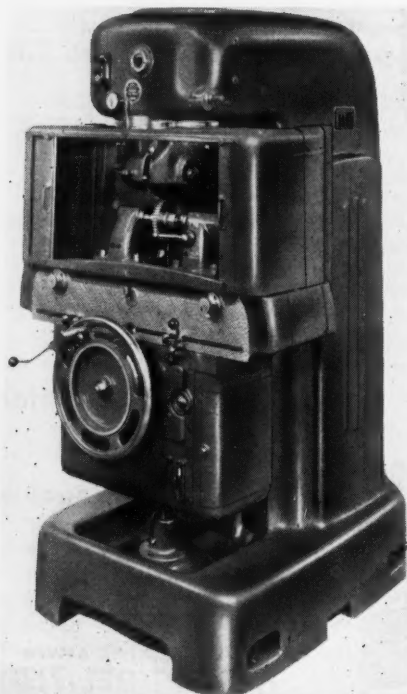
**SMUSSEN MACHINE CO., INC.** 9 Main St., Racine, Wis., U. S. A.



# NEW SHOP EQUIPMENT

## Red Ring Extra Heavy-Duty Gear Shaving Machine

Improved strength and rigidity are the outstanding features of the Red Ring Extra Heavy-Duty Gear Shaving Machine shown herewith, product of the National Broach & Machine Co., 5600 St. Jean St., Detroit, Mich. The frame



Red Ring Extra Heavy-Duty Gear Shaving Machine

of the machine is of heavy "C" type one-piece construction, a feature which is said to provide exceptionally solid support for the cutter head and lead screw under the knee. The cutter spindle is  $2\frac{1}{2}$  in. in diameter. The rigidity of the machine is sufficient so that cut of 0.002 in. over pins, which is approximately 0.0003 in. on a side, can be taken to exact measurements.

The Red Ring Extra Heavy-Duty Gear Shaving Machine makes use of a gashed helical gear form tool in mesh with the work gear, the axes of the work gear and cutter being crossed at an angle of usually 10 to 15 deg. The cutter gear drives the work gear as the latter is traversed back and forth across the cutter, stock being removed in fine, hairlike shavings with a true cutting action. According to the manufacturer, tooth profile, index, eccentricity, and helical angle are corrected and a bright, smooth tooth surface is produced. Horizontal serrations are said to be eliminated. Tooth profile is claimed to be corrected by the generating action to within 0.0001 in. of the profile desired.

An adjustable cam is employed to operate the work table; thus the machine can also be employed for crowning gear teeth. This cam tilts the work table slightly, causing it to follow a curve instead of a straight path and making the teeth slightly thinner at the ends than at the middle. As a result, the ends of the teeth are relieved from bearing against the mating gear, thus avoiding edge bearing of gears, and bearing contact is made through the center where the teeth are strongest.

The knee of the machine is supported by a  $2\frac{1}{2}$ -in. feed screw. To prevent spring, the cutter head is solidly supported on both side of the cutter. The work table is of heavy box construction,  $7\frac{1}{2}$  in. deep, and has an upper

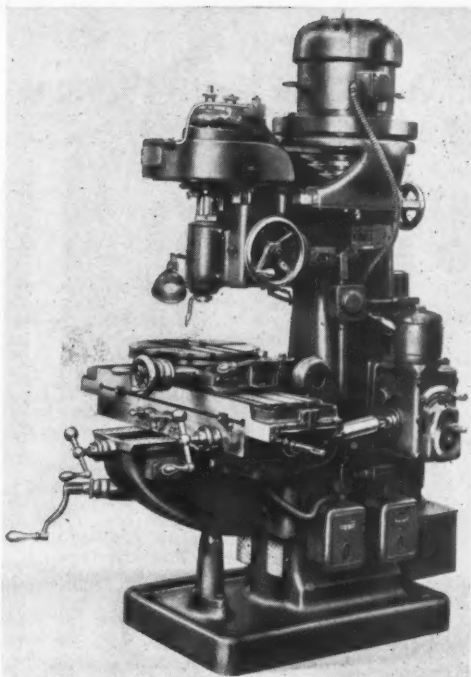
surface of 10 x 35 in. Ample provision for coolant and chip disposal has been made. All moving parts in the knee have force feed lubrication. Individual motor drives are used on the cutter spindle, table, and oil pumps. The automatic feed box is designed so that settings of 0.001, 0.002, 0.003, or 0.004-in. feed can be rapidly made by means of a knob located on the outside of the knee.

Cycling of the machine, including feed and the required number of strokes, can be set for automatic operation. In such an instance, the operator need only mount the gear, start the motor, and the machine will stop when the gear has been completely processed.

## Reed-Prentice No. 3VG Vertical Milling and Die Sinking Machine

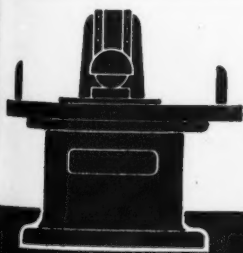
The No. 3VG Vertical Milling and Die Sinking Machine shown herewith, which supersedes the No. 3V machine, is announced by the Reed-Prentice Corp., Worcester, Mass. In the No. 3VG, a newly designed auxiliary bracket is used which incorporates a back gear assembly, as shown, for obtaining slower spindle speeds than can be obtained with direct belt drive. With this back gear assembly, spindle speeds of approximately one-third of those obtained when using a direct belt drive are available.

The machine has a longitudinal power feed of 24 in. and a cross feed of 12 in. The knee can be vertically adjusted up



Reed-Prentice No. 3VG Vertical Milling and Die Sinking Machine

to 18 in., and the head on the column is vertically adjustable up to 5 in. Maximum distance from spindle to table is 18 in.; from spindle to rotary table, 13½ in., and from spindle to frame, 16 in. The rotary table has a working surface of 16½ in., and the machine table has a working surface of 10¼ x



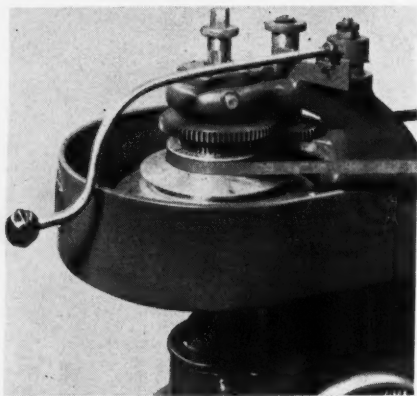
## ABRASIVE Surface Grinders

QUALITY • ACCURACY • DURABILITY • ECONOMY

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**ABRASIVE MACHINE TOOL CO.**

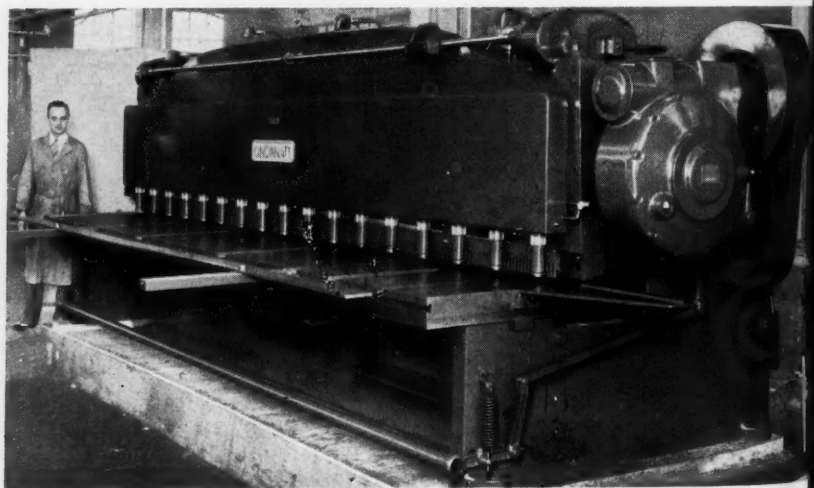
EAST PROVIDENCE, R. I.



Back Geared Spindle Construction of No. 3VG Vertical Milling and Die Sinking Machine With Guard Removed

36 in. The machine table is provided with three  $\frac{5}{8}$ -in. T-slots. The carriage is  $34\frac{1}{2}$  in. long and has 18 feeds ranging from  $\frac{1}{2}$  to  $20\frac{1}{2}$  inches per minute.

The No. 3VG machine is arranged for vertical motor drive with or without electrical equipment. Standard equipment includes four suitable size T-slot bolts with straps, drawbar,  $\frac{1}{2}$ -in. collet, heavy leather curtain, and wrenches.



Cincinnati 4316 Series Steel Plate Shear,  $\frac{3}{8}$ -In. x 16-Ft. Capacity.

## Cincinnati $\frac{3}{8}$ in. x 16 ft. Steel Plate Shear

The unusual length of the 4316 series Cincinnati All-Steel Shear illustrated herewith, built by The Cincinnati Shaper Company, Cincinnati, Ohio, is typical of the progress made in developing heavy plate shears. While the 16 ft. length is more than the customary standard for this thickness of plate, it is not the longest shear made by The Cincinnati Shaper Company as they also build standard shears with 18 ft. cutting length and  $\frac{1}{2}$  in. capacity. The 4316 series shear meets the requirements of those who shear longer than average heavy steel plates, but do not require the larger Cincinnati machines which provide capacities up to 1 in. x 12 ft. or  $1\frac{1}{4}$  in. x 8 feet.

Among the features incorporated in the Cincinnati 4316 series Shear are hydraulic holdowns that automatically clamp any thickness of metal with the same pressure and prevent creeping of the sheet or plate, the low rake of the blade that greatly reduces the twist of narrow strips, the inclined upper knife that produces a sheared edge that is square with the surface of the plate, the micrometer dial, ball-bearing bearing gauge that makes gauging unusually rapid, a safety friction that is provided

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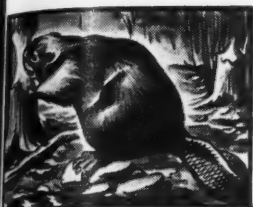
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## THE RIGHT TEETH



## FOR THE JOB

*Nature knows animal teeth! . . . the kinds of "bite" they've got to have to meet their various owners' needs for existence.*

*Nicholson knows file teeth! . . . the kinds of "bite" they've got to have to meet industry's needs in working with various materials toward attaining various results in various products.*

Materials like irons, steels, brass, aluminum, lead, silver, woods, plastics—parts like forgings, castings, moldings—milled, curved, ground or hammered shapes—operations that call for rough, smooth, lathe, edge or precision filing. . . . Consider all these, and it is understandable that *correctness* in files—shape, size, tooth cut and angle, teeth per inch—is tremendously important toward good workmanship, fast production and low filing costs.

There are more than 3000 Nicholson and Black Diamond File types, shapes and sizes with "the right bite for the job."

NICHOLSON FILE CO., PROVIDENCE, R. I., U. S. A.  
CANADIAN PLANT, PORT HOPE, ONTARIO



### FOR STAINLESS AND OTHER ALLOY STEELS

Nicholson has perfected a new file to overcome the peculiar abrasive action of chromium and nickel contents which tend to shorten the life of the general-purpose file. Stamped "For Stainless Steel"—for easy identification and specifying.

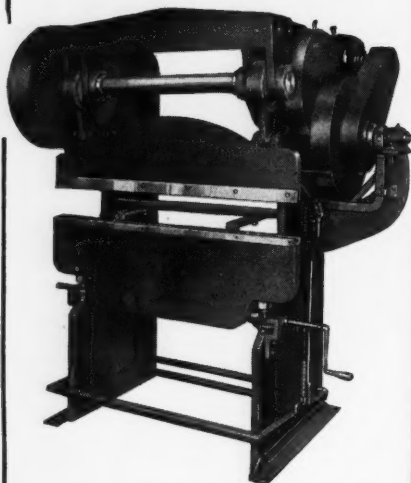
# NICHOLSON FILES

## FOR EVERY PURPOSE



# CHICAGO STEEL PRESS

No. 253



**Does 40% to 60% of the forming work turned out by the average shop.**

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities up to 10 gauge.

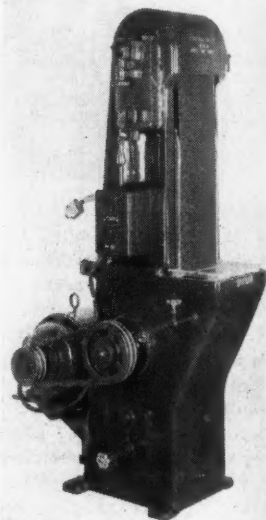
*Write for Circular No. 253*

**DREIS & KRUMP MFG.  
Company  
7418 LOOMIS BLVD.  
CHICAGO ILLINOIS**

for protection against overloading, and the all-steel construction which, according to The Cincinnati Shaper Company, is a guarantee against breakage.

## Porter-Cable Heavy-Duty Belt Grinder Model G-8

A heavy-duty belt grinder equipped for dry or wet grinding has been introduced by the Porter-Cable Machine Co., 30



Porter-Cable Heavy-Duty Belt Grinder  
Model G-8

Wolf St., Syracuse, N. Y. Designated as the Model G-8, the grinder can be operated at a range of speeds from 2,400 to 6,000 f.p.m. for use in grinding metals, plastics, ceramics, glass, rubber, and so on. It can also be used in squaring, cleaning, burring, facing and polishing operations and for removing gates and flashing.

The Model G-8 grinder employs an exceptionally long belt—9 ft. in circumference. A belt of this length is said to reduce heat and to give more economical service. The belt width can be either 8 or 9 in. Built for heavy-duty service, the grinder is equipped with large pulleys and heavy-duty special sealed bearings and is sturdily constructed.

# YOUR PRODUCTS NEED

## Everlock

### W A S H E R S



## SAFEGUARD YOUR ASSEMBLIES

Loosened nuts, bolts, and screws cause annoyances and needless expense to you and your customers. You can avoid this by using Everlock washers—the lockwasher with the unique patented tongue construction.

Leading manufacturers, in various industries, such as the automotive, radio, electrical appliances, heavy machinery, etc., use and depend on Everlock washers in their hidden assemblies. They recognize the fact that the bite of each tongue together with its powerful spring tension is essential to securely hold their assemblies intact. Spring tension alone will not do this. That is why hundreds of millions of Everlock washers are used yearly.

In addition to the washers illustrated, we make many special lockwashers and terminals for various applications.

We carry a large stock of Everlock's at all times, and can fill your rush orders the same day.

Write for your catalog and samples today.

**THOMPSON-BREMER & CO.**  
1640 W. HUBBARD ST., CHICAGO

WHERE OTHER WASHERS HAVE BEEN  
TRIED, NOW EVERLOCK'S ARE SPECIFIED



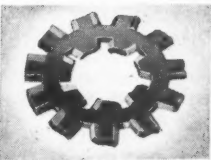
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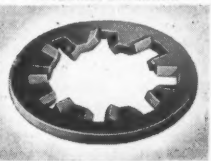
STANDARD  
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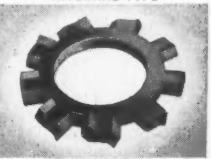
STANDARD 80°  
COUNTERSUNK TYPE



COMBINATION  
INTERNAL-EXTERNAL



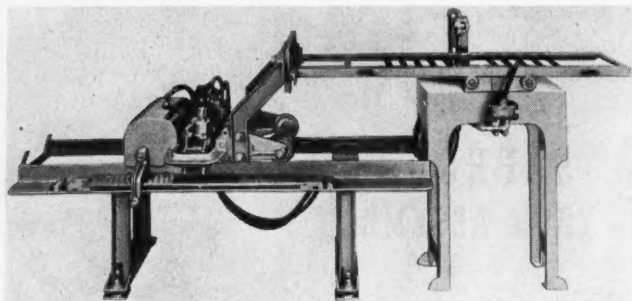
HEAVY DUTY  
INTERNAL TYPE



HEAVY DUTY  
EXTERNAL TYPE

## Pollasky Automatic Feeder

Increased production on stamping operations together with an assurance of safety for the operator are said to be available through the use of the Pollasky Automatic Feeder now being built by A. R. Pollasky, 3920 N. 23rd St.,



Pollasky Automatic Feeder

Milwaukee, Wis. When Pollasky Automatic Feeder is used, blanks are fed to the press automatically, continuously, and at maximum speed. Inasmuch as the operator feeds the blanks to the feeder, positive safety is assured without the use of safety guards.

The Pollasky Feeder can be used in connection with any size or style of press, either mechanical or hydraulic. Any size blanks can be handled, the blank holders, which are inexpensive, being designed to suit the die and the blank. Blanks are supported by springs placed to suit forming and the finished formed piece is ejected from the die by the blank holders as they advance. The blank holders are filled by the operator on either side of the die as the vacant

space is advanced to the left of the die on the forward travel and on the right of the die on the return travel. Blanks placed on the forward travel are formed on the return travel and vice versa. As blanks are placed while the press is in actual operation, maximum production is assured. The tilting rail holder

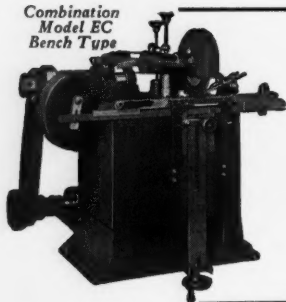
allows the device to be used with an inclined press. The table and carriage can be furnished to operate directly behind the press as desired and the table can be supplied in any length.

The automatic carriage is operated by compressed air. The pins in front and rear spacing bars control the carriage as the carriage contacts the stop pin.

the air cushion locks the carriage to the table with no rebound. The carriage release is actuated by the press slide which can be timed on either the down stroke or up stroke. Operating speed of the carriage is approximately 100 per minute, the rate of production being dependent upon speed of the operator in placing blanks.

The entire set-up can be made in a few seconds, consisting of attaching the blank holder release to the adjustable head and setting the spacing pins in the graduated spacing bars. As the holders are filled while moving away from the die, there is no possibility of the operator's hands drifting into the danger zone. Eliminating of danger assured.

Combination  
Model EC  
Bench Type



## SHARPEN YOUR OWN SAWS

**SAVE OVER 80% ON SHARPENING  
HACK, BAND, CIRCULAR SAWS**

The WARDWELL SAV-A-SAW automatically sharpens saws with teeth as fine as 32 to the inch at a speed up to 75 per minute. Savings on 2 gross of blades will pay for the machine. Assures keener cutting saws at extremely low cost.

Write for complete information

**THE WARDWELL MFG. CO.**

3166 FULTON RD.

CLEVELAND, OHIO

# ACCURATE FLOAT CONTROL

by McCROSKY centralizing "V" lock



**Y**OU can always recognize a McCrosky Adjustable Boring Block by the V-shaped slot in the center of the block. It is an important part of the McCrosky Centralizing V-Lock that permits the operator to control accurately the amount of block-float for the finishing cut. It also permits blocks to be interchanged without removing the centering key. Just two of the reasons why McCrosky Boring Bars perform accurately and save time.

Ask for  
**McCROSKY**

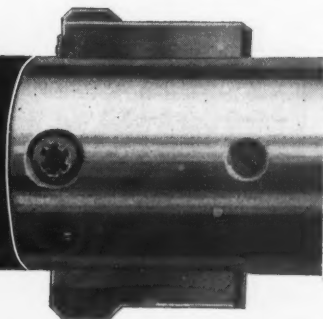


**BULLETIN  
No. 15-B**

## McCrosky Tool Corporation

Meadville, Pa.

**McCROSKY  
ADJUSTABLE BLOCK  
BORING BARS**



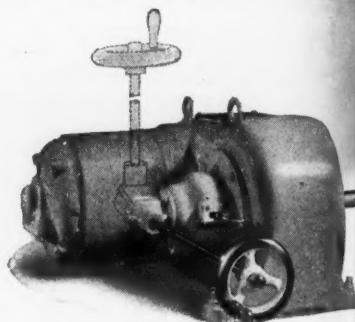
**Ask for Bulletin No. 15-B**

improved working conditions and facilitates increased production. Besides the operation of feeding blanks to a forming die, the machine can be furnished to feed plates to a blanking die or can be used for riveting subassemblies, pressing in bushings, spot welding, riveting chain assemblies, feeding castings to a multiple drill head, and for other similar operations. The table can be supplied in any length. For shearing operations, any size of plate can be fed to a shear at fast speed.

### Mechanical Remote Control for U. S. Varidrive Motor

The illustration shows a single, right angle, mechanical remote control for U. S. Varidrive Motors which has been developed by U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Cal. This control provides an accurate, simple means of selecting the desired operating speed of the U. S. Varidrive Motor when the Varidrive is mounted beneath or above the driven machine or is otherwise inaccessible. Through the use of an enclosed set of helical right

angle gears, the Varidrive control may be extended to a 90-deg. angle any one of eight different directions.



Mechanical Remote Control for U. S. Varidrive Motor

This right angle remote control, according to the manufacturer, permits the handwheel to be placed within easy reach of the operator so that the exact desired speed can be maintained without difficulty at all times.

*"The Blade in the Plaid Box"*

**LENOX**  
HACK SAWS  
BAND SAWS

Before YOUR final decision on hack saws try "LENOX." They are satisfying hundreds from coast to coast.

Furnished in "High Speed," "Mo-Speed," molybdenum "Tungsten" and "Super-Flex" for every metal cutting job.

Sold by Distributors everywhere . . . TRY THEM!

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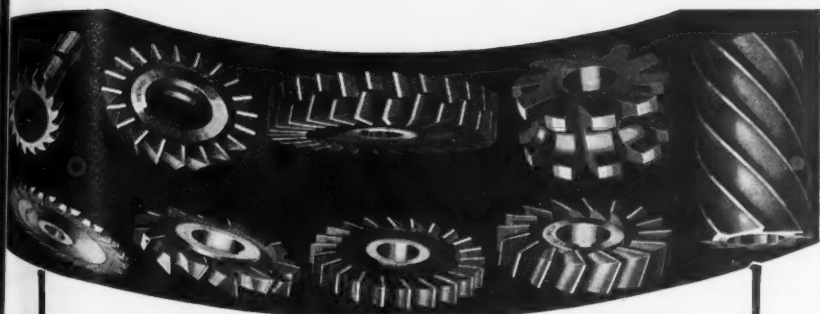
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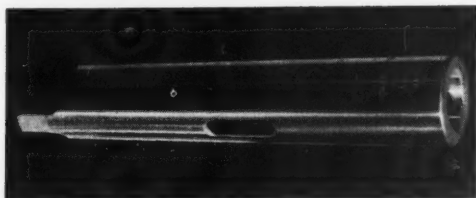
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## MIDWEST PRECISION TOOLS *assure* PRECISION PRODUCTION



★ **SCIENTIFICALLY HARDENED** and precision ground sleeves, Midwest's latest tool development, are guaranteed to give from ten to fifteen times longer life than the ordinary soft steel sleeve.

Midwest hardened sleeves assure you of perfect tool alignment which means reduction to the absolute minimum of drill breakage and work spoilage because of tool run-out.

*Don't delay—write today for complete information.*

**Some Territories available for manufacturers' agents of proved ability**

CARBIDE TIPPED TOOLS • DRILLS  
REAMERS • MILLING CUTTERS  
SPECIAL TOOLS • FORM TOOLS

SLEEVES • ADJUSTABLE HOLDERS  
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**MIDWEST TOOL & MFG. CO. • DETROIT, MICHIGAN**

*Offices in All Principal Cities*

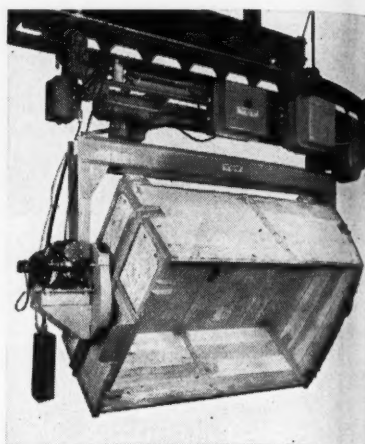
**Main offices and factory — 2337 West Jefferson Avenue, Detroit**

## Cleveland Tramrail Box Grab and Carrier

The Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio, has developed a full-rotation box grab and tramrail carrier for material handling. With the grab, boxes are turned to any desired position by means of a gear-motor drive. If desired, a complete turn can be made. This type of grab is especially desirable where gradual dumping is required. Through the use of a twin hoisting unit, boxes can be raised or lowered as desired. The boxes handled are firmly clamped in position by means of a handwheel located at the end opposite the gear-motor rotating mechanism.

The carrier shown herewith is designed to handle boxes 48 in. wide, 72 in. long, and 30 in. deep and will carry 2,000 lbs. of materials. It has a full load hoisting speed of 20 ft. per minute and a travel speed of 150 ft. per minute. A push-button station is used for all operations including turning. Although the box shown with the unit is of wood, steel boxes are said to be handled with equal success.

The carrier is particularly adaptable for transporting boxes of material from storage to mixing machines. In this connection, several boxes may be used



Cleveland Tramrail Box Grab and Carrier

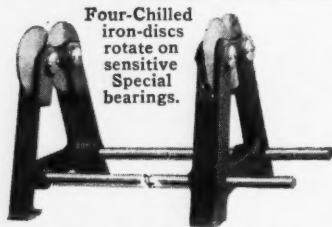
with one tramrail grab and carrier. The grab can also be used for handling crates, machines, and so on, which are to be turned or rolled over. Grabs can be furnished for small or large boxes and for loads up to 5 tons (including box, grab, and material).

### Improved Anderson Balancing Ways No Leveling Required

A simple and excellent device for balancing, straightening and truing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



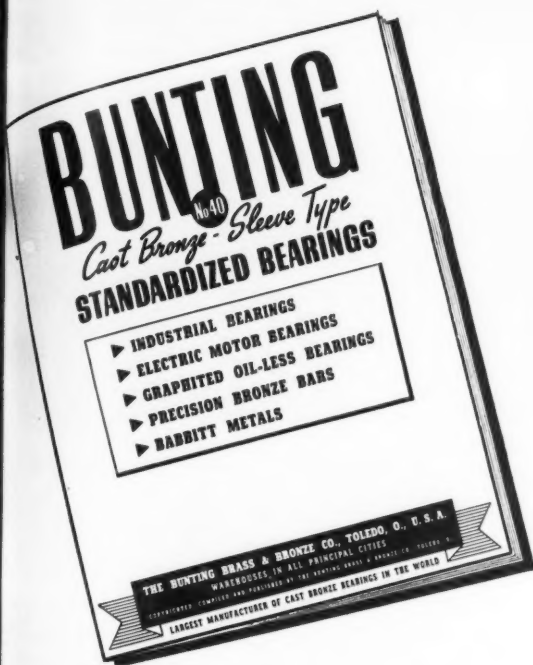
Write for Full Information

Made by **Anderson Bros. Mfg. Co.**  
1926 Kishwaukee St. Rockford, Ill.

## Shaw-Box "Load Lifter Jr." Electric Hoists

Shaw-Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., 40 Broadway, Muskegon, Mich., announces the addition of two hoists—one of 500 lb. lifting capacity and the other of 1,000-lb. lifting capacity—to its "Load Lifter Jr." line of electric hoists. The hoists are of the low head room, wire rope and drum type and are built for heavy duty service. On both models the hook in its highest position comes to within 12¼ in. of the bottom of the beam on which it travels. The hoists are available in lug suspension for bolting in place, hook suspension for hanging in place, or for use with a push-type ball bearing trolley for operation on either I-beams or special monorail track sections.

Features in the design and construction



# BUNTING 1940 CATALOG



● This latest Bunting Catalog lists many new sizes of Standardized Bearings and contains much valuable information . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

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# BUNTING

**BRONZE BUSHINGS • BEARINGS  
PRECISION BRONZE BARS • BABBITT METALS**



**A SURE CATCH  
WITH A Surer GRIP -**



## Better Than a Tall Story

When the first Big One of the season strikes your hook, a sure grip on your rod is better than an alibi later....If your screw machines are equipped with Sutton **DIA-MOND-GRIP** Collets your production record will need no alibis. Their surer grip under less tension holds your output to schedule and eliminates the threat of slippage.

## Sutton **DIA-MOND-GRIP** Collets



**SUTTON TOOL COMPANY**  
2895 W. Grand Blvd., Detroit, Mich.  
Accessories for Screw Machines

tion of the Shaw-Box "Load Lifter Jr." Electric Hoists are light weight (weight complete with trolley, 180 lbs.), forged steel gearing, the standard Shaw-Box two-gear reduction drive, and ball bearings throughout. They are supplied with



Shaw-Box "Load Lifter Jr." Electric Hoist

either pendent cord or push button control for operation on either single phase or poly phase alternating currents.

## Progressive Spot Welding Gun Mounted on Extension Handle

A unique device consisting of a light weight, hydraulically operated, spot welding gun mounted on one end of a light weight, current-carrying, aluminum extension handle designed to simplify the problem of spot welding in relatively inaccessible locations such as long inside seams on circulator heater cabinets has been built by Progressive Welder Co., 711 Piquette Ave., Detroit, Michigan.

Each of the two aluminum sections which comprise the handle conduct the current from the single bolt cable connection at the input end to a similar

ifter Jr.  
t (weigh  
, forged  
Shaw-Bu  
ball bear  
plied with

# STUDY THIS EFFICIENT SET-UP OF DAVIS BORING TOOLS



**IT Has Resulted in  
Greater Accuracy,  
Speed, Economy, for**



The tools pictured in this photograph incorporate multiple cutter boring heads, each with four roughing, four semi-finishing, and four finishing cutters. Each cutter has an individual locking and adjusting arrangement, and the heads are removable for arbor grinding. In addition, the tool in the right foreground of photo is provided with four serrated type facing cutters, and stop nuts for controlling the proper location of same.

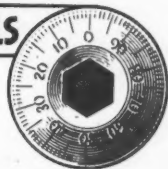
Important loading and machining advantages are derived from the pilot design, which, being of a diameter sufficient to clear the cutting heads, is of the quill type in order to reduce weight and friction.

Hardened wear strips inserted on the surface of both the quills, or outer pilots, and on the inner support bar, or body of the tools, further reduces friction and, at the same time, provides a compensation for wear. This greatly increases the life of the tools under constant heavy production.

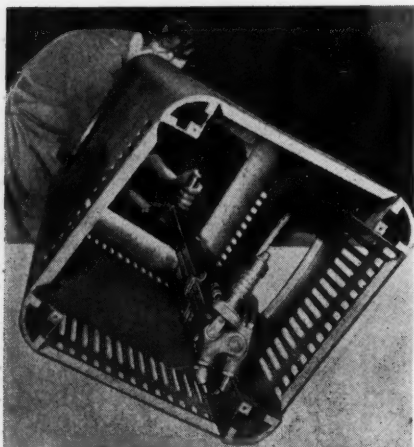
Send us prints of **your** special or unusual work, for a helpful, specific recommendation. Davis Boring Tool Division, Larkin Packer Company, Inc., St. Louis, U. S. A.

# DAVIS

**BORING TOOLS**



single bolt connection at the gun end. In addition to carrying the welding current, each extension handle element is of hollow section to permit intake and



"Progressive" Spot-Welding Gun Equipped with Aluminum Extension Handle for Operation in Inaccessible Places

return of water for cooling the gun and supply for the pressure cylinder on the welding points. A hydraulic pressure gun is carried in a flexible hose along the top of the handle. Push button control at the operator's end of the unit is in the form of a handle for easy manipulation.

In the case illustrated, the cabinet is stamped and formed in vertical sections. The sections are then placed in a jig so designed that each inside seam to be welded, can, in turn, be vertically located. The operator places the weld-

ing points of the gun in position and begins making the welds at 1½-in. centers, sliding the gun down the entire length of the seam in one continuous operation. To permit close control of spot locations and to provide easier operation of the unit for the section of the seam beyond the middle, a wheel mounted on the under side of the extension handle provides the necessary balance.

Included in the assembly of the Progressive spot welding device is a transformer on which is mounted the hydraulic booster which supplies the pressure cylinder on the gun, the timing control, and so on. Production speed of the spot welding unit approximately 40 cabinets per hour.

## Martin Model No. 6-A Punch Press Enclosure Guard

Illustrated herewith is the Model No. 6-A Punch Press Guard for plunger enclosure which has been placed on the market by W. I. Martin & Co., 108 N. Dearborn St., Chicago, Ill. This guard is designed to simplify the protection of operators engaged in blanking, forming or feeding strip stock by hand or with automatic or mechanical feeds.

To provide rigidity and light weight the slotted gates of the unit are cast of aluminum, and each gate can be horizontally or vertically adjusted to fit varying sizes of dies and presses, thereby permitting work to be fed or held but at the same time preventing the operator's hands from entering the "danger zone." The gates are each 5 in. wide x 7 in. high and have ¾-in. vertical slots. The side gates may be tilted inward wherever desired. An adjustable bracket mounting permits the enclosure

# HINGES

**VARIOUS WIDTHS  
and GAUGES**

**BUTTS AND  
CONTINUOUS LENGTHS**

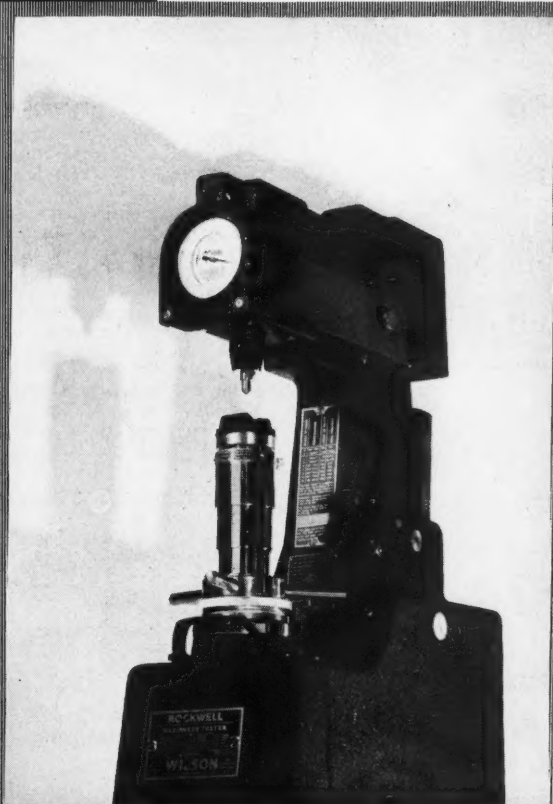
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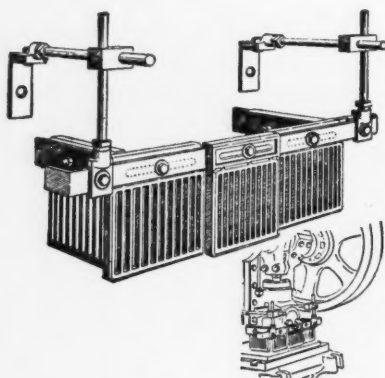
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guard to be raised or lowered as a unit or removed as an entire guard assem-



PAT PENDING

Martin Punch Press Enclosure Guard  
Model No. 6-A

bly. The guard brackets can be mounted by means of bolts on the front of the press without drilling or tapping

special mounting holes. All steel parts are cadmium plated.

The Martin Punch Press Enclosure Guard is available in three standard sizes. The Model No. 6-A shown here with has a maximum width of 15 1/2 in. and is supplied complete with mounting equipment.

## Roper Rotary Pump

The Roper Rotary Pump shown here with is one of a line of rotary pumps which has been announced by the Geo. D. Roper Corporation, Rockford, Ill. Containing over 7,000 different units, the line includes pumps ranging from 1 to 1,000 g.p.m. capacities at speeds up to 1,800 r.p.m. and against pressures up to 1,000 lbs. per square inch. At present, 21 different drives and mountings are available ranging from ordinary foot hub, and flange mounting heads to complete bedplate units for direct motor drive, gear reduction, and flat or V-belt drive.

An outstanding feature of the Roper Rotary Pump is "hydraulic balance," a feature which is said to equalize internal pressure at all points and absorb

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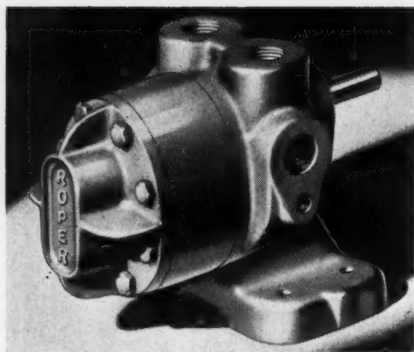
The American motor car industry has an invested capital of one and one-third billion dollars, provides employment (directly or indirectly) for more than 6,000,000 men, and is the country's largest consumer of steel, rubber, plate glass, upholstery, mohair, nickel, lead, gasoline and lubricating oil. Its plants run at high speed, lead the world in production efficiency. Its metal cutting requirements call for an increasing degree of accuracy and a constant lowering of costs. Wherever these twin results are most satisfactorily achieved, you'll find Barnes Hack Saw Blades and Band Saws on the job.

# BARNES

To serve the motor industry—and a score of other important industries—Barnes Hack Saw Blades and Band Saws are carefully made in a plant devoted exclusively to metal-cutting blade manufacture. Tooth cutting, setting, heat-treating, drawing and quenching employ the most modern machinery, electrically controlled furnaces, expert supervision backed by years of experience in quality blade production.

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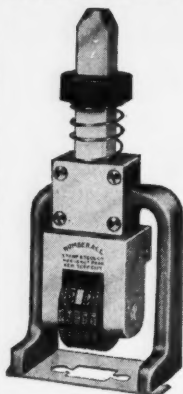
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DETROIT MICHIGAN



Roper Rotary Pump

shock or thrust from the power end of the drive shaft. Other features include choice of spiral, spur, or herringbone gears; conventional packing box, spring-loaded packing box or mechanical seal; sleeve bearings; built-in or external relief valve, and eight different piping arrangements.

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## "Dura-Bond" Method for Bonding Soft Rubber to Steel and Aluminum

A method for bonding soft rubber and Neoprene to steel and aluminum by means of hot vulcanization, to be known as the "Dura-Bond" process, has been developed by the Hewitt Rubber Corp., Buffalo, N. Y. With this process, the composition of the rubber is said to be modified in such a manner that it will attach itself integrally to the metal and still retain its capacity to vulcanize itself to the outer rubber layer. Adhesion strengths of from 500 to 750 lbs. are obtained by the process. Heat conditions for which Hewitt safely recommends the "Dura-Bond" process include temperatures up to 200 degrees Fahrenheit.

The illustration herewith shows the largest steel cylinder ever rubber covered by Hewitt and involved the use of the "Dura-Bond" process. The rubber compound used in the outer layer met

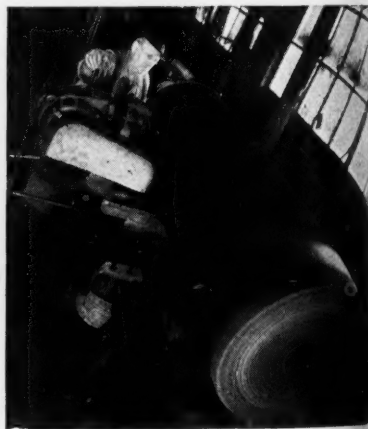


Illustration showing steel cylinder which has been rubber covered by "Dura-Bond" process.

to the cylinder was developed to withstand acid solutions as well as cuttings and abrasions caused by the action of steel passing at terrific speeds over the cylinder. Heretofore, no cylinder over 18 in. in diameter had been rubber covered by Hewitt. The cylinder shown in the illustration is 77 in. long and 24 in. in diameter. One inch of rubber covers

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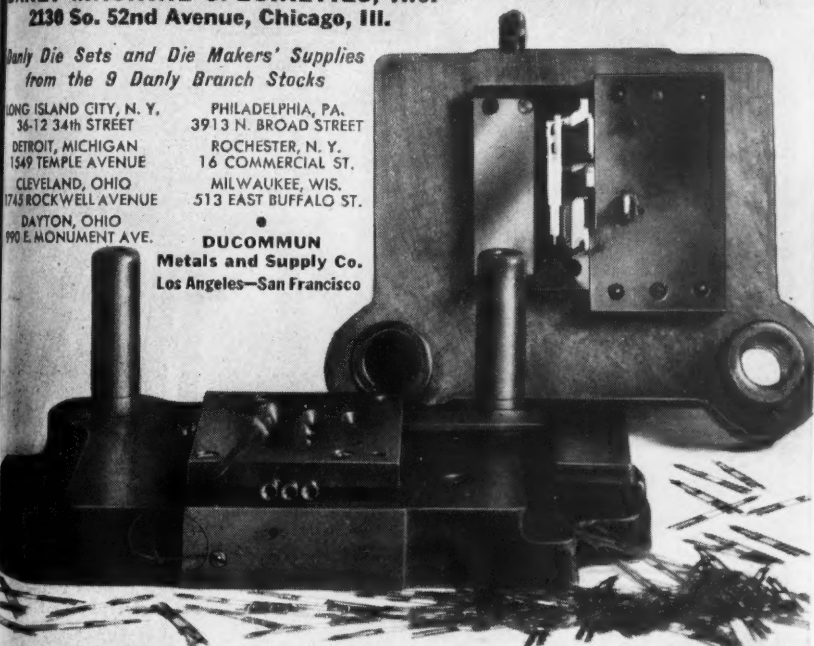
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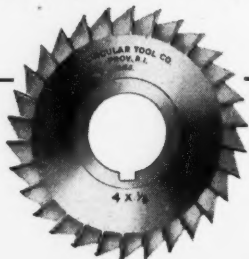
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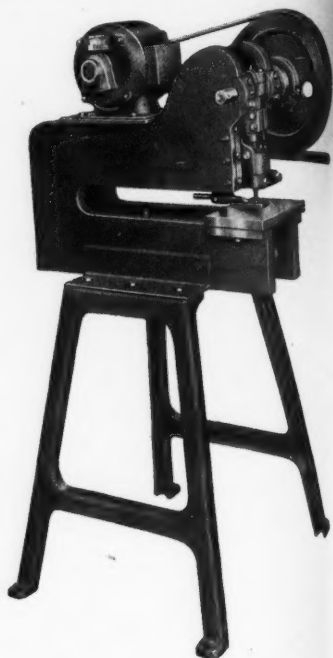
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the main body of the cylinder. The cylinder ends and a large portion of the shafts are also rubber covered.

With present equipment, Hewitt states that they are now able to rubber cover cylinders up to 2 ft. in diameter, with shafts extending up to 1½ ft. on either side.

## Whitney Deep Throat Power Press No. 18-B

A deep throat power press designated as the No. 18-B has been brought out by the W. A. Whitney Mfg. Co., 63 Main St., Rockford, Ill. This machine



Whitney Deep Throat Power Press No. 18-B

has an 18-in. depth of throat and will punch holes up to ½ in. in diameter through 16 gauge steel. It is designed primarily for use in plants in which sheet steel punching operations are performed such as stove, poultry equipment, and sign manufacturing plants. The press is supplied complete with motor and starter.

• Carbide wheel the off-ally hu be mea The ne Diamo of skill mizes b allows As a re makes tically experie be used the too

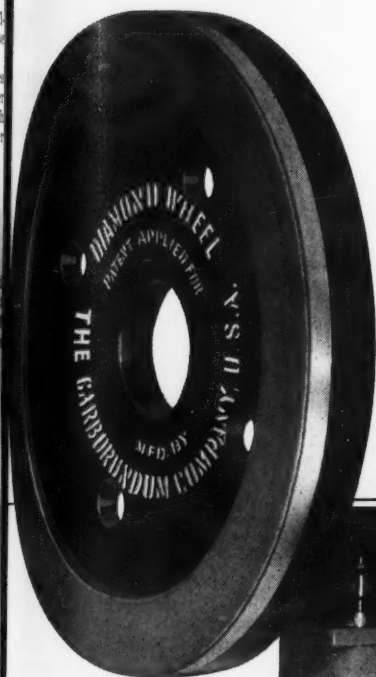
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## DIAMOND WHEEL



**For Grinding  
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Carbides**



• Carborundum research has now produced a metal bonded diamond wheel that is practically indestructible. It is designed particularly for the off-hand grinding of all types of cemented carbide tools, and literally hundreds of tools may be ground with wheel wear too slight to be measured.

The new wheel is made of uniformly hard Belgian Congo Industrial Diamonds, embedded under extremely high pressure in a special bond of skillfully alloyed metals. This assures high heat conductivity, minimizes bond disintegration or wheel breakdown, and at the same time allows a reasonably high cutting rate.

As a result, the Carborundum Brand Metal Bonded Diamond Wheel makes possible a very low wheel cost per piece ground. Being practically indestructible, it can be used by operators having but little experience in grinding cemented carbide tools. Proper care should be used, of course, to avoid grinding pressures heavy enough to damage the tool. For a complete list of advantages write for illustrated leaflet.

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Higher Production  
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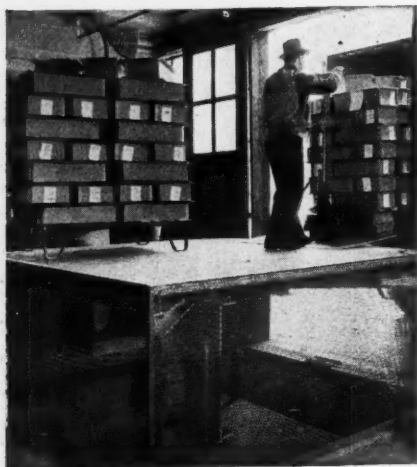


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## Curtis Hydraulic Lifting Cylinder

The illustration shows a hydraulic lifting cylinder which is now being marketed by the Curtis Pneumatic Mch.



Curtis Hydraulic Lifting Cylinder

Co. Division of Curtis Mfg. Co., St. Louis, Mo., for use in elevating work platforms or wherever hydraulic lifting is desired. This lifting cylinder can be operated either from regular shop air lines or from a separate motor-driven hydraulic pump. It is available in capacities up to 16 tons and can be used with practically any type of work platform.

Inasmuch as it employs an oil-type locking mechanism, the Curtis Hydraulic Lifting Cylinder, according to the

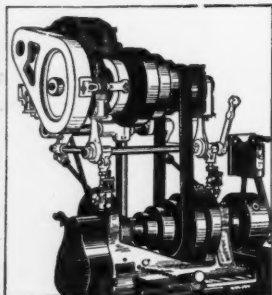
manufacturer, can be operated with safety at all heights. With this type of locking mechanism, the cylinder cannot be lowered until not only all of the air is exhausted from the tank but, in addition, until the hydraulic oil-lock valve is opened. As soon as this oil-locked valve is released, the lift automatically stops lowering and is hydraulically and positively locked at that point.

## "American" Bonded Pre-Finished Metals

Two pre-finished bonded metals which are said to combine the beauty and durability of chromium with the lightness, strength, and workability of aluminum are now being marketed by American Nickeloid Company, Peru, Ill. These two plated metals will be known as Nickel Aluminum and Chrome Aluminum.

The metals are formed by a surface of chromium or nickel bonded by the Krome-Alume electrolytic process to an aluminum base metal. Nickel Aluminum and Chrome Aluminum are adaptable for manufacturing name plates, bottle covers, metal fume vents, and so on. They are available in sheets up to 36 x 96 in. in a full range of tempers and in gauges from 0.010 up to 0.064 in.

A choice of bright or satin finish and striped, crimped, or corrugated patterns adapts the metals to many uses and designs. The manufacturer states that both Nickel Aluminum and Chrome Aluminum are easily workable during manufacturing processes and are highly resistant to corrosion, rust, or tarnish. They can be bent, stamped, or moderately drawn without damage to the bonded coatings.

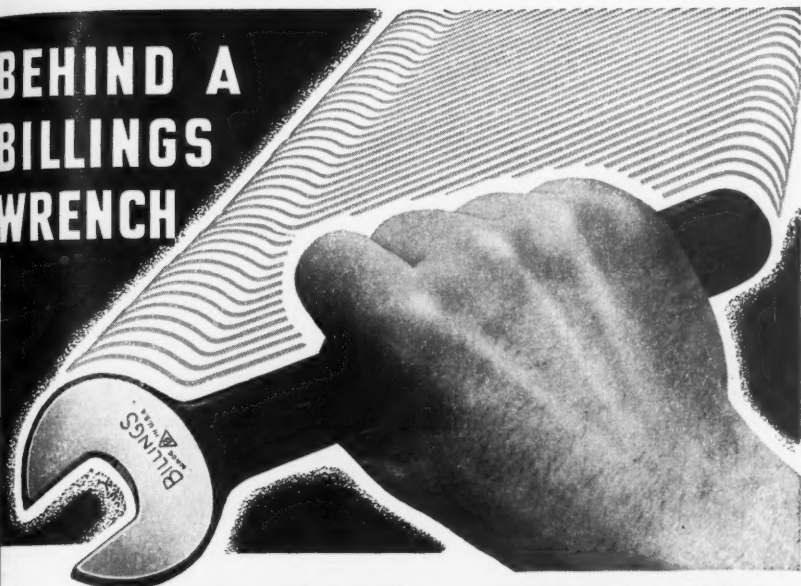


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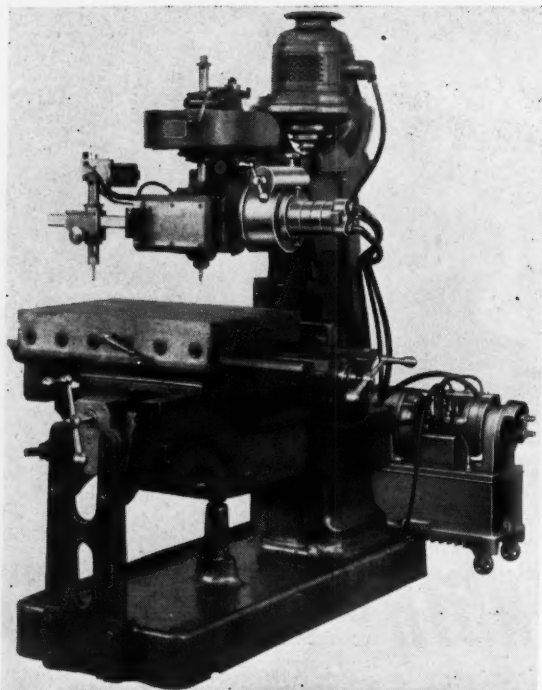
Today, Billings Forged Tools are better than ever because behind each Billings Wrench is the "father to son" experience, knowledge and ability of men skilled in the art of forging. This craftsmanship is perpetuated from generation to generation—each striving to better the design, steel analysis, strength and finish of Billings Tools.

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## FORGED *Billings* TOOLS





Detroit Universal Duplicator  
Mechanism

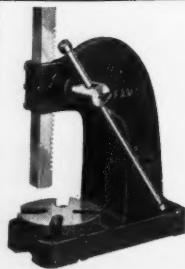
### Detroit Universal Duplicator Mechanism

Greater accuracy and faster production in the duplication of dies, molds, and so on, are said to be among the important features of an improved duplicating control and drive mechanism announced by the Detroit Universal Duplicator Co., 225 St. Aubin St., De-

troit, Mich. The duplicator can be used either to actuate the table feed or, through the auxiliary control, the head feed of vertical milling machines. The latter method is said to enable a higher degree of accuracy to be obtained.

The drive consists of a hydraulic motor mounted on the milling machine head which is connected to the down feed through a 300 to 1 reduction gearing. Two flexible hydraulic cables supply fluid from the duplicator unit for operation. A hand crank provides for manual movement of the head down feed when setting-up work. Damage to the machine due to over-run of feed is eliminated by means of the special reduction gearing which is designed to slip if the head reaches the limit of travel.

Largely contributing to the high degree of accuracy obtainable with the Detroit Universal Duplicator is the improved electrical control system governing impulses to the feed drive. This mechanism provides high speed superimposed impulse interruptions, contact for each impulse to the feed drive being interrupted before that impulse has actually been converted into motion of the machine being controlled. In this manner, feed control is broken down



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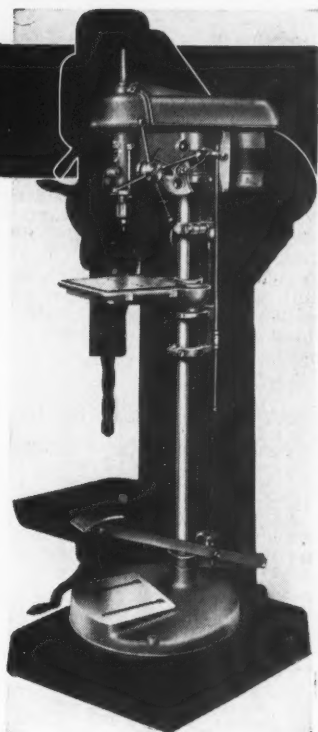
Government does not levy all of the taxes paid by industry. Some of the most costly of all are self-imposed. For example, the plant that uses heavy machine tools to do work for which Walker-Turner light machine tools are better suited is taxing itself needlessly.

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Walker-Turner was a pioneer in the movement toward weight conservation in machine tool design. Excessive weight in such equipment is expensive, both in initial cost and in operation. Progressive design of Walker-Turner tools is as sound as the principle of weight conservation in the automobile and aircraft industries and other up-to-date mechanical developments.



## A TYPICAL WALKER-TURNER VALUE

The Model FD961 Drill Press illustrated here, equipped with Jacobs Key Type Chuck, four precision ball bearings, six-spline spindle and many other refinements sells for \$77.25 less motor. Weight: 185 lbs.

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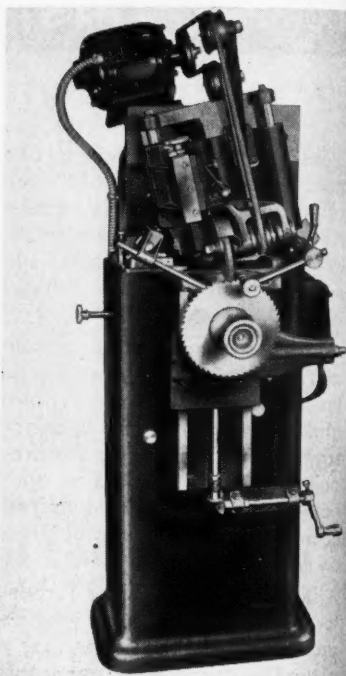
into unusually minute steps, thus permitting the operator to obtain accuracies up to 0.0015 in. on most types of work.

When the duplicator is to be used with lathes for form turning or contour boring and with shapers for form shaping on die sinkers, horizontal milling machines, boring mills, and so on, the flexible cables are disconnected and plugged. Fluid from the control valve then goes to the standard hydraulic motor which is mounted on the duplicating unit, and the machine tool feed is controlled through a drive shaft coupled to the duplicator and the machine tool feed mechanism.

### Covel-Hanchett No. 11-30 Precision Metal Saw Sharpening Machine

To simplify the task of sharpening the high efficiency saw blades now coming into wide use through the introduction of the hydraulically-operated cold metal sawing machine, the Covel-Hanchett Co., Big Rapids, Mich., has brought out the No. 11-30 Precision

Metal Saw Sharpening Machine shown in the illustration. Teeth on the saws for the machines referred to must be more accurately ground than the teeth



Covel-Hanchett No. 11-30 Precision Metal Saw Sharpening Machine

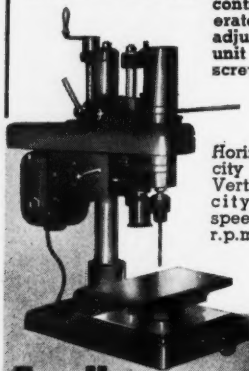
on the ordinary metal cutting saw in order to operate at the high speeds at which these saws are run, in addition to which the tooth forms are considerably different from the types of tooth forms ordinarily used for cold sawing.

To ensure accuracy in the grinding of the saw teeth, it was necessary to develop a machine which would be absolutely accurate, with anti-friction bearings throughout, and with a cam action of such design that teeth of the proper shape with the special clearances involved could be ground. From the illustration of the saw tooth shapes which are ground in this machine, it will be apparent that the saw has as one of its features a tooth shape designed to obtain the proper rolling action of the

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### Super Sensitive Drilling Machine

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Horizontal work capacity, center, 9 1/2". Vertical work capacity, 10". Spindle speeds, 750 to 12000 r.p.m.

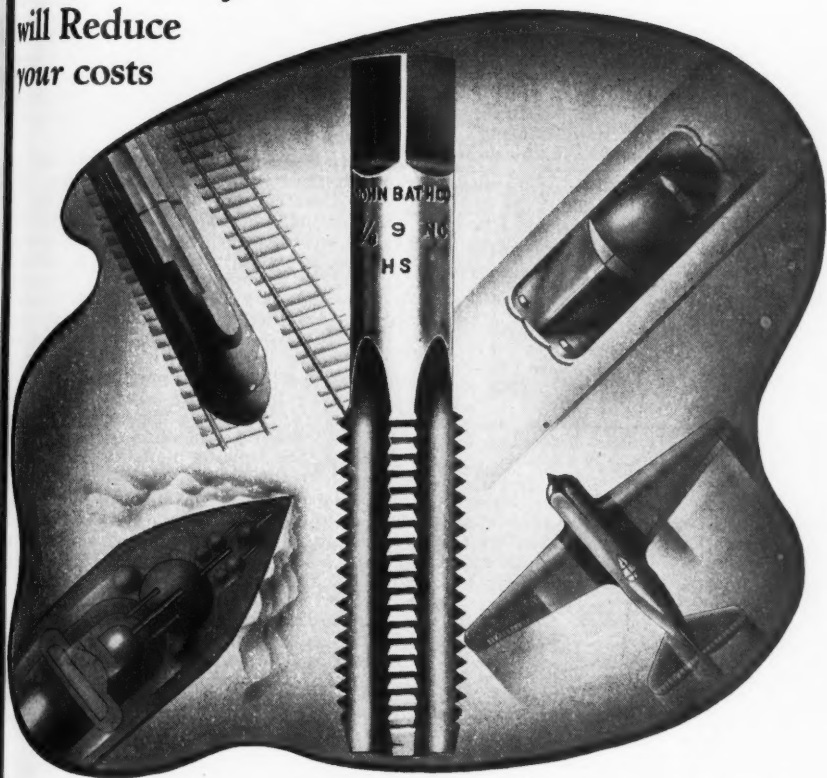
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e shown  
the saws  
must be  
the teeth

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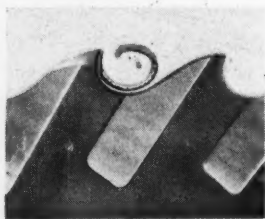
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WORCESTER • MASS.

chip being cut. This special tooth shape is automatically ground and formed by the cams mounted inside the base of the



Drawing Illustrating Type of Saw Tooth Ground on Covell-Hanchett No. 11-30 Precision Metal Saw Sharpening Machine

No. 11-30 machine. The saw in which this tooth is used is equipped with alternate high and low teeth to assure distribution of the load between the teeth, and the grinding of the high and low teeth is also accomplished automati-



The Covell-Hanchett Metal Saw Sharpening Machine produces a tooth designed to cut the chip with a rolling action.

cally on this machine. The high teeth are bevelled on each side to ensure the proper cutting action, the grinding of the bevels in the side of the teeth also being an automatic operation.

## Builders "T" Surface Grinder

A hand-operated utility surface grinder, designated as the Builders "T," has been brought out by Builders Iron

Foundry, 9 Coddling St., Providence R. I., for use in grinding tools, dies and small machine parts. An outstanding feature of the grinder is the table which rests directly upon the plane-ground surface of the bed and is guided longitudinally and laterally by a T-square action control. This construction is said to enable unusual accuracy and finish to be obtained, since there is no play to affect the thickness of the work and but one oil film subject to the grinding pressure. The cross feed screw and nut, as well as the T-square and other bearing surfaces, are completely protected from dust by the large apron on the table.

The Builders "T" Surface Grinder requires but little effort to operate. The box construction of the bed is said to assure rigidity and prevent distortion. The sturdy upright has three ground ways to which the saddle is clamped when in grinding position. To adjust the wheel roughly to position, the saddle clamp is loosened, leaving the saddle free from the ways so that adjustment can be made with a minimum of effort. After reclamping the saddle to the ways, the final adjustment of the wheel to the work is made by means of a micrometer handwheel, which moves the spindle housing about on a pivot in the saddle.

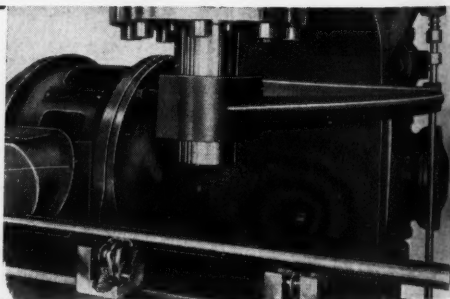
The weight of the driving motor holds the spindle housing against the micrometer adjusting screw, eliminating backlash. The spindle is equipped with a tapered bronze bearing at the front and a radial ball bearing at the rear. To adjust for wear, an adjusting nut is screwed against the vertical shoulder, thereby returning the spindle to its proper position in the tapered bronze bearing. This bearing is arranged so that adjustment can be made without

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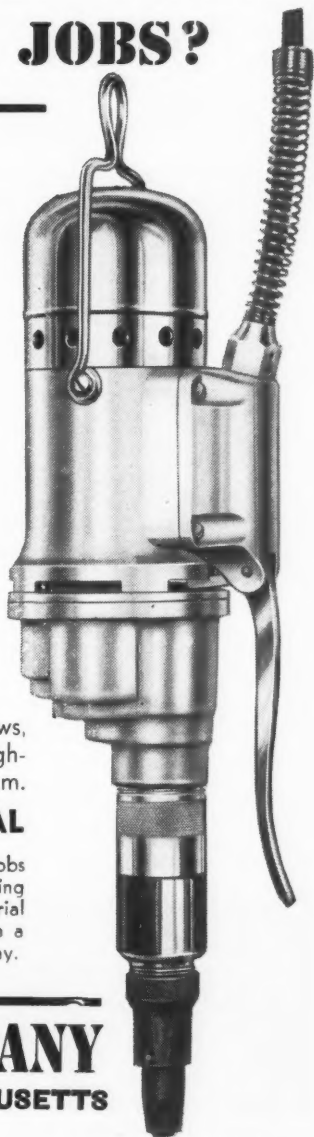
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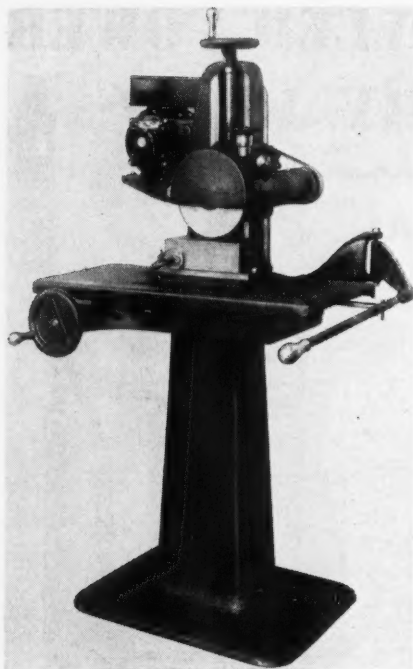
Millers Falls Electric  
Screw Driver No. 50

## MILLERS FALLS COMPANY

GREENFIELD



MASSACHUSETTS



Builders "T" Surface Grinder

distortion.

According to the manufacturer, the unique design of spindle housing and saddle assures absolute freedom from vibration, a feature which, together with the T-square action principle, produces maximum stock removal combined with toolroom accuracy and finish. The table has a platen with one T-slot for  $\frac{3}{8}$ -in. bolts. A magnetic chuck is 8 x 4 in., or

a mechanical fixture with a suitable opening for work within the capacity of the machine, can be furnished. The mechanical work fixture has provision for mounting truing diamond.

The Builders "T" Surface Grinder is available for either bench or floor mounting. The motor drives the spindle through a V-belt and is mounted on a pivoted base readily adjustable to give proper belt tension. A  $\frac{1}{4}$ -h.p., 110-volt, 60-cycle, single phase motor is furnished as standard equipment. For greater stock removal, a  $\frac{1}{2}$ -h.p. motor of any current characteristics can be furnished.

## Ozalid Model "A" Automatic High Speed Whiteprint Machine

Ozalid Corporation, 354 Fourth Ave. New York, N. Y., has brought out the Model "A" Automatic High Speed Whiteprint Machine shown herewith. The machine employs a quartz envelope high pressure mercury vapor lamp which, according to the manufacturer, provides an extremely fast printing speed, ranging up to 20 linear ft. per minute, and assures uniform distribution over the entire printing surface. This lamp has been designed and manufactured especially for the Model "A" whiteprint machine.

The Ozalid Model "A" Automatic High Speed Whiteprint Machine is available in two sizes for production of prints up to and including 42 and 54-in. widths. An ingenious device automatically separates the print from the original after exposure. The original is returned to the operator in front of the machine, while the exposed print is automatically conveyed to the developing unit where, after dry development,

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it is discharged at the rear of the machine ready for immediate use. A variable transformer in the primary circuit permits a variation of intensity of the high pressure mercury vapor lamp from full brilliancy to 60 per cent of light without loss of energy. This dimming arrangement is extremely important.



Ozolid Model "A" Automatic High Speed Whiteprint Machine

since it allows the operator to select the desired intensity and permits continuous and uniform production of prints despite variations in tracings.

The high pressure mercury vapor lamp is cooled by an alternating air blast, which passes through the space between the revolving contact cylinder and the fixed cylinder surrounding the quartz envelope high pressure mercury vapor lamp. By alternating the cooling air stream, high temperature between the left and right sides of the contact cylinders is avoided. A small metered quantity of cooling air is also allowed to enter and pass through the inner cylinder and over the quartz tube. In this manner, the temperature of the lamp is maintained within a relatively small range, a requirement absolutely essential for this type of light.

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Cut illustrates the new 510 Oliver automatic twist drill pointer—for drills  $\frac{1}{4}$  to 3"—Variable point angles—Variable clearances.

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## W-S 50-Ton Automatic Compression Molding Machine

The Watson-Stillman Co., Roselle, N. J., announces a 50-ton automatic compression molding machine for use in molding thermosetting materials and thermoplastics. The machine consists essentially of one vertical and one horizontal cylinder, a hydraulic power unit, and a feed and an ejector mechanism, automatically operated and timed to function in proper sequence. The vertical and horizontal pistons have a diameter of 11 in. The rams are 8-in. diameter and have a stroke of 12 inches.

Full-automatic control applies to all successive operations from the feeding of loose granular or preformed material into the hopper to the final ejection of molded parts and compressed air-cleaning of dies. The molding cycle can be repeated automatically over an indefinite period with no manual operation whatever. A double rotary pump driven by a 7½-h.p. motor enables one molding cycle to be completed in 30 seconds or less.

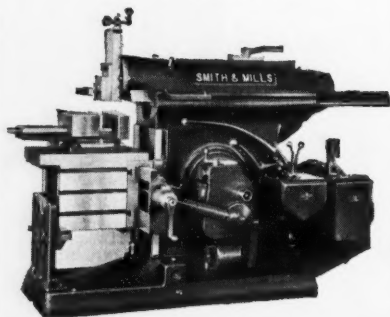
Control over predetermined quantities of feed, timing, ejection, and so on, is

positive and is safeguarded by special devices. Flash, semi-positive, positive or split-type dies may be utilized. The arrangement for mounting of dies is



W-S 50-Ton Automatic Compression Molding Machine

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such that the dies move out of line while the molded pieces are being ejected. Steam-heated die plates are supplied as standard equipment; electrically-heated plates are obtainable if specified.

The W-S 50-Ton Automatic Compression Molding Machine is 8 ft. 10 in. long, 2 ft. 9½ in. wide, and 9 ft. 8 in. high. The die plates are 10 in. from top to bottom, 18 in. from front to back, and 10 in. from left to right. The machine has a maximum vertical opening of 22 in. and a horizontal opening between plates of 22 in. Weight, 11,000 pounds.

## Landmaco Threading Machine Adapted for Shell Tapping

The illustration herewith shows an entirely new application for the Landmaco Threading Machine, product of the Landis Machine Co., Inc., Wayneboro, Pa. Designed primarily for cutting external threads, the machine, in this application, is equipped with a Landis Style ALT Collapsible Tap to permit the cutting of internal threads on the fuze plug ends of shells. Although

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7/32	12	9	1.60
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9/32	12	9	1.85
5/16	12	9	2.00
11/32	12	9	2.25
3/8	12	9	2.50
13/32	12	9	2.75
7/16	12	9	3.00
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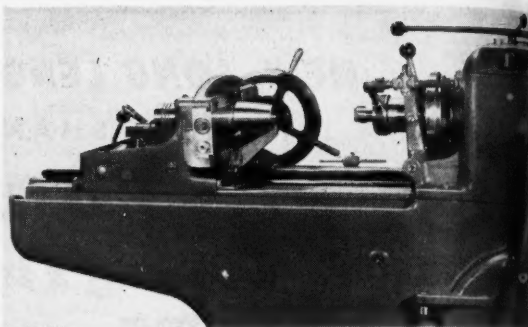
**251 Centre Street**

**New York, N. Y.**

the illustration shows the machine arranged for tapping a 75 mm. shell, other sizes of shells can be tapped as well.

In addition to substituting the collapsible tap for the usual Lanco Head, special accessories for the arrangement include a gage arm, special round grips, and a work-supporting cradle. The gage arm protrudes beyond the carriage front and provides a definite stop against which the work is located before it is clamped into the carriage front. It is of utmost importance that the work be located accurately, since the tapped thread bottoms against a shoulder. Furthermore, the overall thread length must be held within very close limits; and, if the work was not definitely located, there would be the continued danger of breaking the tap chasers against the bottom of the hole.

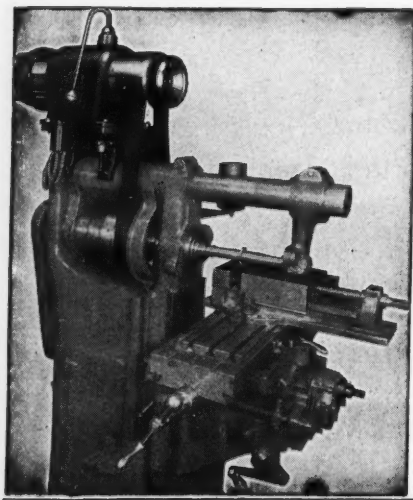
Special round grips are employed to assure the correct alignment of the



Landmaco Threading Machine Adapted for Shell Tapping

work with the center of rotation of the tap. These grips are wide of face and are ground to conform to the diameter of the work. Since the entire carriage front incorporates both vertical and horizontal adjustments, the grips can readily be indicated and adjusted until they are in almost perfect alignment to assure a high degree of thread concentricity. The special work supporting cradle is located on the car-

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sizes of work. Accurate arc control. Big overload capacity. Uses as little as 5c worth of power per hour. Available in 75, 100, 150 and 200 amp. sizes. Price for 75-amp. size \$150, f. o. b. Cleveland, freight prepaid. Other sizes are slightly higher.

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riage directly back of the carriage front. This cradle also is ground to conform to the diameter of the work and is located on the carriage in alignment with the center of rotation of the tap.

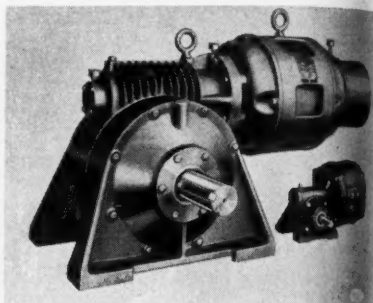
In operating the machine, the work is laid on the cradle and is then pushed forward through the grips to the stop. The ground surface of the cradle prevents any marring of the surface of the work. The grips are then closed on the work, and the lead screw is engaged. When the predetermined thread length has been cut, the tap automatically collapses, and the work can be withdrawn.

According to the manufacturer, the shell tapping arrangement of the Landmaco Threading Machine permits shell threads to be tapped well within the specifications for work of this type. Because of the high threading speed which can be employed, production is claimed to be 300 to 400 per cent higher than by the methods previously employed for producing the shell threads.

## Janette RW Type Speed Reducers

The Janette Mfg. Co., 556-558 W. Monroe St., Chicago, Ill., is now marketing a line of right angle worm gear type speed reducers ranging from  $\frac{1}{8}$  to 10 h.p. Designated as the RW, the line consists of six sizes. The illustration shows the smallest and largest size speed reducer of this line; namely, the Types RW0 and RW5 respectively. Single phase, squirrel cage, slip ring, and direct current motors are available for driving the RW type motorized units, and single reduction worm gears cut from the finest materials are used. The substantial grey cast iron housings of the reducers have unusually heavy

mounting feet located at the point where torque is taken from the housings. Large radiating surfaces are provided for heat dissipation, and cooling fins are



Janette RW5 and RW0 Type Speed Reducers

cast integral with the section of the housings enclosing the worms.

Janette RW Type Speed Reducers are supplied with motors ranging from  $\frac{1}{8}$  to 10 h.p. and with output speeds of from 12.7 to 447 r.p.m. The RW5 type speed reducer is available for either flange or foot mounting, and any size RW reducers can be assembled in 10 different mounting positions.

## Rockwell-Bristol Dilatometer

A Dilatometer designed by Stanley P. Rockwell of Hartford, Conn., is now available through The Bristol Company, Waterbury, Conn. The Rockwell-Bristol Dilatometer, Model RB, is a direct reading Dilatometer which both indicates and makes an ink record of time-dilation and temperature-dilation changes simultaneously, during heating and



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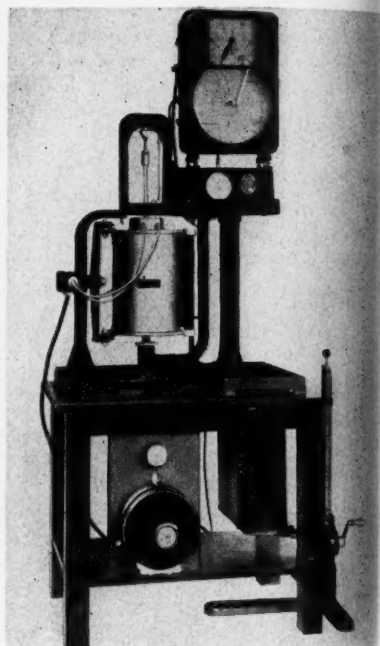
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Rockwell-Bristol Dilatometer

tol Pyromaster Potentiometer, 12-in. round chart, and the time element is recorded by a separate pen through a Telechron clock.

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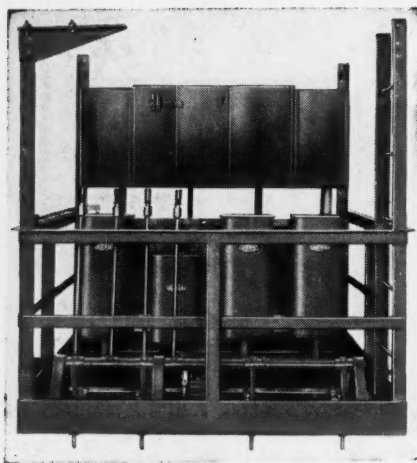
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P & H Overhead Traveling Crane Cab

are fully enclosed. All wiring is in conduit with junction boxes and in accordance with Underwriters' rules. The sectional panel switchboard has inverse time overload relay protection and is covered with an all-steel cabinet. The doors of the cab are hinged for ready access. When a door is open, the safety-type main switch is inoperative. In addition to a hydraulically-operated foot brake, the cab is equipped with a mechanical emergency brake. To guard against slipping or falling, a toe angle guard of approximately 6 in. in height is provided. For further protection, a warning foot gong is arranged on the cab. The front operating levers are closely spaced so as to provide the operator with a convenient group of controls and maximum front visibility.

## "Pluramelt" Steel-Making Process

Through the development of a new melting technique, Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., is now producing special steels of two or more compositions, integrally bonded together, and known as "Pluramelt." Pluramelt in its numerous analyses is the product of an electric furnace melting technique, as a result of which all of the special composition materials and a small part of low cost materials are melted and integrally joined during this operation. The furnace proper is radically different from the conventional type of electric furnace in that the functions of steel making and of the mold are combined. With this equipment special steels are melted and joined to low cost steels in ingot form, thus producing Pluramelt ingots.

The composition of the special steels is controlled simply and within the ranged specified in commercial practice today. The points to be emphasized are that the process produces single ingots of two or more compositions, integrally bonded together, and that it is possible to change the composition, within limits, during the melting operation.

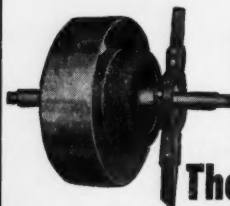
Experience so far has been limited to Pluramelts of stainless alloys (high chromium-iron and chromium-nickel-iron alloys) on soft or medium steel, and tool steel types on soft steel bases, but it seems likely that the commercial success with these materials may be duplicated with any other alloy that can be melted in an arc furnace. High carbon steel can be combined with mild steel; the low alloy S.A.E. steels can be used in any desired combination: hard alloys or tool steels for wear re-

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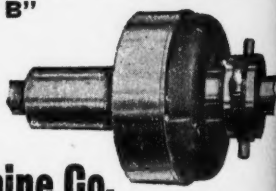
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The **new** NICHOLS Hand Miller is designed for volume production of a wide variety of small parts, accurately and at low cost. It is particularly adapted to the requirements of the tool room where minimum set-up time is demanded.

## **SPECIFICATIONS**

Longitudinal Feed, 10". Transverse Feed, 7". Vertical Feed of Knee, 13½". Vertical Movement of Head, 4½". Table can be brought up to the center line of Spindle. Micrometer dials on Transverse and Vertical Feeds. Hand-set stop for vertical movement of Head.

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sistance can be applied to slabs, rails, roll cylinders, or wheel treads. High nickel alloys can also be so treated. The base metal can be covered on both sides and triple or more layers made of any desired proportionate thicknesses.

Thus far the materials which have successfully been produced are Allegheny Metal 18-8S (low carbon, 18 per cent Cr, 8 per cent Ni), the same with columbium, molybdenum, or both, low carbon 13 per cent chromium steel, and various tool steel compositions for the alloy portion, and low carbon and carbon-molybdenum steels for the massive portion. In the majority of cases the massive material is plain low carbon steel. Ingots have also been produced of three compositions integrally joined and these ingots have been processed in plates and sheets down to 24 gauge. Pluramelt wire has also been produced. The principal requirements are (a) a joint between compositions—base and surface layer—that is flawless; (b) uniform and correct composition in both base and surface layers; (c) ease in fabrication.

Bend Tests. The accompanying drawing shows the types of free bend tests that have been made and are self-explanatory with the exception of possi-

bly No. 4, which was made from a piece with a very thick layer of alloy. This bend may be considered a radial bend. In No. 5 a short length of alloy was machined away, leaving sharp re-entrant corners at the base. In all the tests the sections are bent cold until ends of the test bars meet. Elongations

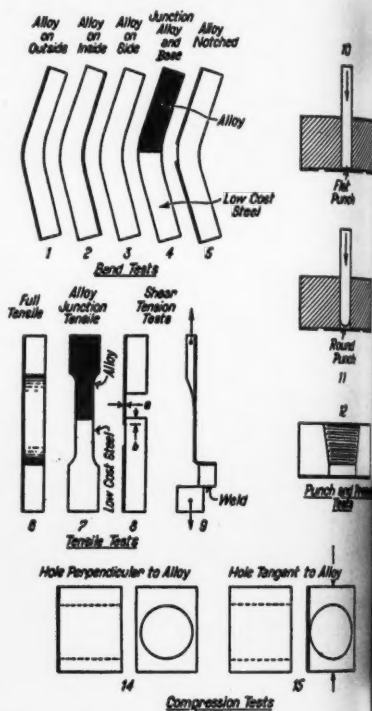


Illustration of tests made to prove soundness of both low carbon steel base and high alloy steel surface lines of "Pluramelt."

of outer fibers on bend bars are about 45 per cent. There is no sign of parting of the special material away from the massive backing portion in any of them; neither is there fissuring or any other failure of the alloy materials. The first two bend tests are perhaps not so usually drastic, but the side bend, radial bend, and notched bend (Nos. 3, 4 and 5) stress the "junction line" severely. It has been proved by many repetitions of these tests for several compositions that Pluramelt steels are integral and behave similarly to sections of mono-

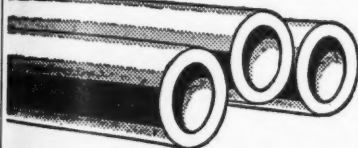
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melt steels. Sections tested with alloy on both sides have acted similarly.

**Tension Tests.** In specimens cut from a plate like that shown as No. 6, and pulled in a tension machine, the special composition material at the side and the massive material deformed together, both compositions necking down without parting. When the two compositions have different yield points, two separate "drops of the beam" will occur. It has been found that the special materials will add to the tensile strength of the base by an amount equivalent to the strength of the actual mass of the special material present.

As may be anticipated, the tensile data are similar to those for a test piece of the base metal. Tests were made on pieces cut from manway trim from a pressure vessel in shop fabrication, the plate being 1½ in. thick with ⅜-in. alloy facing (13 per cent Cr, 0.10 per cent C max.). The vessel and test pieces had been annealed two hours at 1,450 deg. F., furnace cooled and stress relieved two hours at 1,225 deg. F., and furnace cooled. Four test pieces showed 69,200 to 71,100 psi. ultimate strength and from 23 to 25 per cent elongation in 8 inches.

Many tests similar to No. 7 show that

in such a bar failure takes place some distance from the junction of the two steels in the weaker material. With No. 8 an attempt was made to measure the strength in shear along the junction line. The exact value is uncertain owing to the eccentric loading, but failure occurs in section a rather than in shear until dimension b approaches the thickness of the overlay. When failure occurs at b, it invariably does so along the 45 deg. shear plane in the base metal and not at the junction.

Test No. 9 was also designed to test the bond, using a rectangular section of Pluramelt with the alloy steel on one side only. The massive material is machined away at the center of the bar, after which the specimen is bent 90 deg. at the bottom and an attachment welded on so that the junction line is tested directly in tension. Many such tests on different compositions show that failure takes place in the thin alloy section with no peeling away of the alloy from the carbon steel.

Punch Tests Nos. 10 to 12 were prepared by drilling through the massive carbon steel, laying bare the underside of the special composition. Using either a sharp punch, a cupping punch, or



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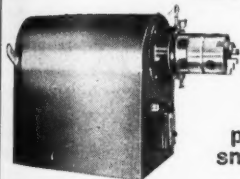
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Any desired spindle speed at will—from a low of 65 r.p.m. to a maximum of 6300 r.p.m. (at a ratio of 13 to 1)—simply by moving a hand lever! Does the job quicker, better, cheaper!

Equipped with Standard NEMA frame motor, completely enclosed; automatic braking system; 1-jaw universal chuck. All parts quickly, easily accessible. Rugged. Occupies 12"x18" bench space. Write for Cir. 400. We design lathes to meet your individual production requirements. Write!

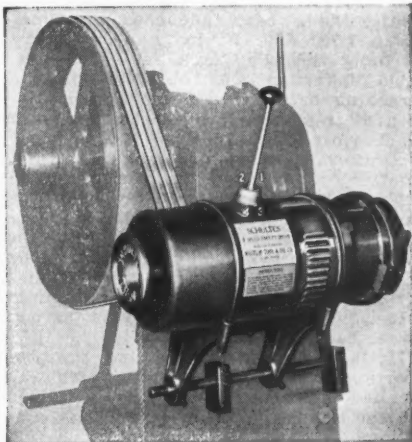
**SCHAUER MACHINE CO.**

2060 READING ROAD, CINCINNATI, OHIO

## NEW

## ALL-HELICAL GEARED 4 SPEED SCHULTES UNIT

Instant Reversibility



### Features:

For punch presses, lathes, shapers, milling machines, drill presses, etc. One lever synchromesh shift controls 4 speeds.

Instant reversibility with all 4 speeds. Adapted to V-belt, flat-belt, chain or direct drive.

Hand wheel permits rotation of machine spindle for set-up work with complete safety.

Cradle adjustment permits the unit to be revolved to any desired position... placing gear shift lever where most convenient.

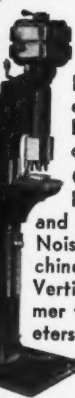
*Write for illustrated folder*

**WESTLOF TOOL & DIE CO.**

430 BELLEVUE AVE. DETROIT, MICH.

## GRANT

Noiseless Spinning Riveters



2 to 6 Spindles

Head rivets from smallest to 3/16" diameter. Built with automatic trip or foot operation.

Other types include Double-Spindle Horizontal and Single-Spindle Vertical Noiseless Rivet Spinning Machines, and Single-Spindle Vertical Hammer type Riveters.

WRITE FOR FOLDER

**The GRANT MFG. & MACHINE Co.**

96 Stillman Ave.  
BRIDGEPORT, CONN.

hydraulic pressure, the alloy diaphragm bulges or shears without lifting any of the alloy from the base metal.

Compression Tests were prepared by drilling square blocks as shown in Nos. 14 and 15 and squeezed vertically until the sides collapsed. No parting could be observed in these pieces. Square bars have been twisted cold more than 720 deg. without failure. Blocks and heavy plates have been quenched 20 times from 1,200 deg. F. by a water spray striking the alloy face only. Considerable distortion was observed but no cracking or separation took place. Repeated tests have proved that the joint is flawless.

Uniformity of composition is also a matter of extreme importance. The noble surface must not only have the intended composition, on the average, but there must be no segregation or major variation, point to point. The case can be demonstrated by studies of low carbon, 18 per cent chromium steel intermelted with a plain carbon steel base.

It is important to note that the proportion of the base material which was melted has been completely dissolved in the low carbon alloy layer, and samplings taken at different locations, top to bottom and point to point, show no more than incidental variations in analysis. This is illustrated by the following ingot analyses:

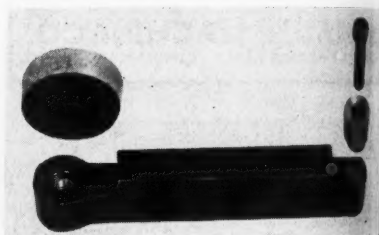
Depth Below Surface	% Cr
At surface .....	18.3
$\frac{1}{4}$ in. ....	17.9
$\frac{1}{2}$ in. ....	17.9
$\frac{3}{4}$ in. ....	17.8
1 in. ....	18.1
$1\frac{1}{4}$ in. ....	18.0
$1\frac{1}{2}$ in. ....	18.1
$1\frac{3}{4}$ in. ....	18.2

Minor segregation is most readily

shown by drastic corrosion tests, where in micro-segregates are attacked more readily and result in frosted, pitted or depressed surfaces. Several hundred corrosion tests have been made of the alloy portion of Pluramelt and the resulting data have definitely shown that the alloy portions show corrosion rates practically identical to similar alloy compositions made by conventional electric furnace processes. As regards fabrication properties, ample shop experience with Pluramelt indicates that it lends itself well to shop practices and can be fabricated in the same manner as other metals.

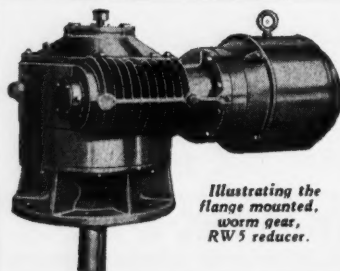
## Forest City Radius Tool Set

A radius tool set consisting of eight interchangeable high speed circular cutting tools, an alloy steel holder, and two wrenches has been placed on the market by the Forest City Bit & Tool Co.



Forest City Radius Tool

Rockford, Ill. Each of the circular cutting tools has a hole drilled through the center and is provided with a hub designed to fit snugly into a counter-bored threaded hole located in either



Illustrating the flange mounted, worm gear, RW5 reducer.

## Janette SPEED REDUCERS

43 Styles—1/50 to 10 H.P.—.08 to 1140 r.p.m.

Janette speed reducers are compact, rugged, pleasing in appearance, easy to install or maintain, reasonably priced, built complete and guaranteed by ONE organization. As adjustments and maintenance on belts, pulleys, chains or slide rails are not necessary, delays in production can be reduced. Better lighting is possible, as overhead belts, pulleys, hangers and line shafting can be eliminated.

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No. 4  
Motor  
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Machine

Mounted  
on  
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Burke motor driven milling machines, Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

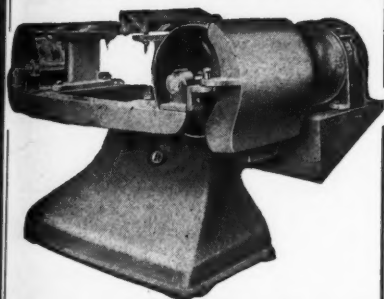
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**BURKE MACHINE TOOL CO.**

157 E. 16th St.

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## PEERLESS ABRASIVE SURFACERS



Are Fast for GRINDING and  
SANDING flat surfaces of Metal,  
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### TRU-LAY PUSH-PULL CONTROLS

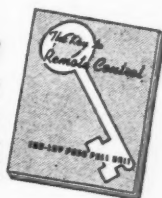
will give your operators instant, positive, safe remote control of the switches, valves, clutches, and other mechanisms on your machines.

TRU-LAY Push-Pulls permit changing the point of control at will. They hold any position to which they are set.

Quickly snaked around any obstructions. Can't become noisy or sloppy. Require no adjustments.

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The booklet "The Key to Remote Control" will show you the way to new advantages in the operation of your machines. Write for your free copy.



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1879  1940

# HARGRAVE

## Tested Tools

ASK YOUR JOBBER



### CHISELS

Cold  
Cape  
Dia. Pt.  
Half Rd.  
Rd. Nose



### PUNCHES

Pin  
Solid  
Prick  
Center  
Lining



### Cut Faster, Last Longer

Alloy Steel, Individually Tested for hardness, toughness and freedom from flaws, assuring satisfactory service. Many patterns.

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**The Cincinnati Tool Co.**  
1947 Waverly Ave., Cincinnati, Ohio

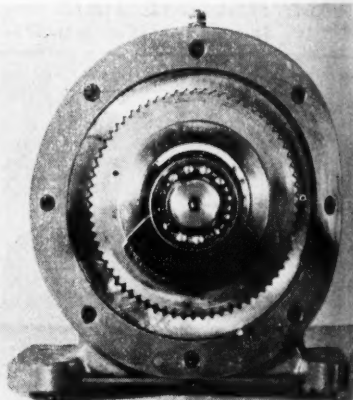
end of the alloy steel holder.

The tools are held in place by means of hollow set screws, the larger size tools being used at one end of the holder and the smaller size tools at the other end. The circular design of the radius cutters is said to assure long tool life since the entire circular edge can be used in turning. The cutting angle of the circular tools is designed to provide a smooth, clean surface.

The following radii can be turned with the tools of the set:  $\frac{1}{8}$ ,  $\frac{3}{16}$ ,  $\frac{1}{4}$ ,  $\frac{5}{16}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$ , and  $\frac{3}{4}$  in. The holder is  $\frac{3}{4}$  x  $1\frac{1}{4}$  x  $5\frac{1}{2}$  in. in dimension. The complete set of eight tools, holder, and wrenches is conveniently fitted into a wooden block having a separate compartment for each size tool.

### Brad Foote Speed Reducer

The Brad Foote Gear Works, 1301 S. Cicero Ave., Cicero, Ill., has brought out a speed reducer which develops high ratio reductions and unusually high torque ratings in small space with effi-



Brad Foote Speed Reducer

ciencies at from 70 to 90 per cent. Compact in size, the high ratio speed reductions are developed without the use of large gears or drives.

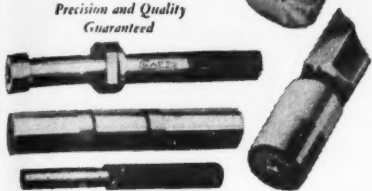
The mechanism consists primarily of a double spur or combination spur and internal gear ball bearing mounted on drive shaft eccentric which meshes with a stationary internal gear. In mesh with the secondary gear is an internal gear which is solid and concentric with

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OF SUPERLATIVE  
**CRAFTSMANSHIP**

CARBOLLOY-TIPPED  
TOOLS AND GAGES  
DIAMOND TOOLS

AND WEAR PARTS  
*Precision and Quality  
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## KNURLS

*Lapped after Hardening*  
150 stock numbers  
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Specials.

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*Accurate—Rugged*  
Send for catalog  
and attractive  
Prices.

**REED SMALL TOOL WORKS**

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We also have in stock  
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**Cullman Wheel Co.**

1336 Altgeld St., Chicago



the output shaft. The concentric drives the initial spur around the pitch line of the stationary internal gear. Since the initial spur and secondary gear are solid, the speed of the latter is controlled by the ratio between the initial spur and stationary gears.

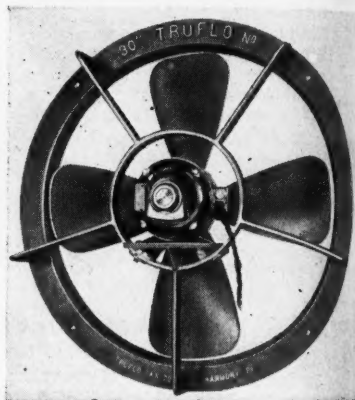
Large ratios are obtained through a small difference in the number of teeth in the spur gear and internal gear, making the pitch line of the spur almost conform to that of the internal gear. Thus a large number of teeth are engaged, increasing the load-carrying factor. Efficiencies of this design range between 70 and 90 per cent with reduction ratios of 20:1 to 7500:1.

### Truflco Aluminum Alloy Wall Fan

The Truflco Fan Co., 536 Main St., Harmony, Pa., announces two series of wall fans of aluminum alloy construction ranging in diameters from 12 to 36 in. and from 42 to 48 in., and employing four and six-blade propellers respectively. Motors range from 1/40 to 7 1/2 h.p. with a maximum capacity of

40,000 cu. ft. of air per minute.

Illustrated herewith is a 30-in. diameter four-blade propeller fan commonly used for exhaust purposes. When desired, this fan can be supplied with a guard and automatic shutters. The frame and propeller blades are of high tensile aluminum alloy and each is cast in one piece. Such construction is said



Truflco 30-In. Diameter Four-Blade Propeller Fan

### U. S. HEADS STANDARD SINCE 1915.



Two Spindle Head  
Both Spindles  
Adjustable

The United States Drill Head Co.

1954 Riverside Drive  
CINCINNATI, OHIO

to permit proper balance at high speeds, thus reducing excessive weight on the motor shaft and ensuring as nearly as possible perfect running balance. This principle of construction is also said to eliminate power loss and to increase air velocity. The wheel is mounted directly on the motor shaft.

Truflco Aluminum Alloy Wall Fans can be designed for any available current. Motors are available for single and variable speeds with horizontal or vertical mountings. Speeds of the larger fans range from 340 to 860 r.p.m. and those of the smaller fans from 715 to 1,750 r.p.m.

### Dykem Hi-Spot Blue No. 107

To meet the demand for a standard non-drying preparation for use in locating high spots when scraping bearing surfaces, The Dykem Co., 2301 N. Eleventh St., St. Louis, Mo., has placed on the market a paste to be known as "Dykem Hi-Spot Blue No. 107." This paste is soft, uniform, and intensely blue in color, spreads easily and evenly



#### DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, a listing of more than 195,000 stock sizes and 46 different styles afford a service that is unsurpassed.

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**E.A. BAUMBACH MFG. CO.**

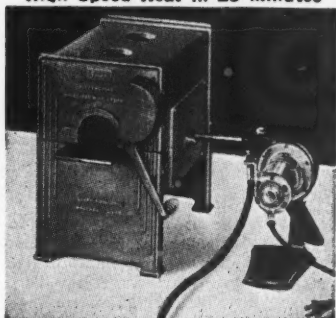
1806 S. Kilbourne Ave.

Chicago, Ill.

## "Stark"

### "ELECTROBLAST"

High Speed Heat in 20 Minutes



Powerful torch used separately as a very handy portable flame, \$30. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3 1/4"x2 1/4", \$40. Also a larger furnace with built-in torch, muffle 7"x4 1/4"x3 1/4".

**STARK TOOL CO.**

Originators of the American Bench Lathe  
Est. 1862 Waltham, Mass.

# FLEXOID INDUSTRIAL COUPLINGS

## Thermoid Hardy Type

A coupling by which ends of shafts are permanently bolted to flexible Thermoid fabric discs—no metal-to-metal bearing surfaces. Provides strong, durable, pliable joint, requiring



no lubrication—no attention.

All shocks, vibrations and jolts absorbed—increasing life of driving unit. Operates horizontally or vertically. No backlash—suitable for reverse rotation. Write for data and prices.

## FLEXOID COUPLING CO.

The Smith Power Transmission Co. • 410 Lakeside Ave., N. W., Cleveland, Ohio

and transfers clearly from master surface gage to show up the high spots on a bearing surface.

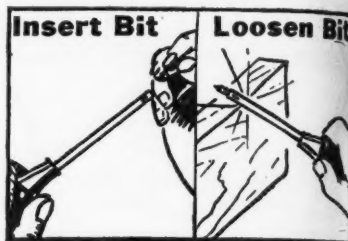
According to the manufacturer, the paste does not dry out but remains in condition on work indefinitely, consequently eliminating the necessity of "night clean-up" and "morning re-bluing." Dykem Hi-Spot Blue No. 107 is said to be especially useful for scraping flat bearing surfaces of lathes, planers, milling machines, and so on.

### Stanley Replaceable Bit Screw Driver

A replaceable bit screw driver designed to take various sizes of tailor-made bits to drive either Phillips or slotted head screws has been placed on the market by Stanley Tools Division of The Stanley Works, 137 Elm St., New Britain, Conn. This tool is said to be especially valuable for industrial assembly work and in places where screws are driven in quantity.

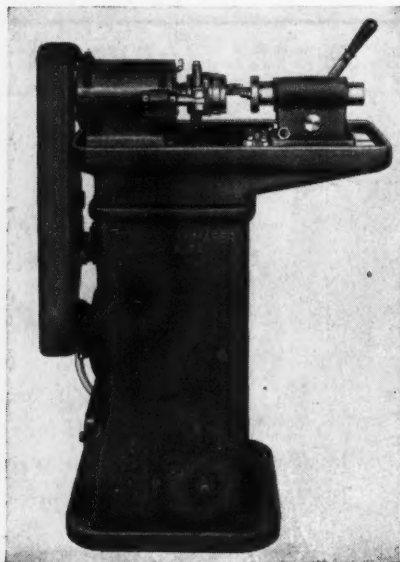
As shown in the illustration, the tool holder has a chuck forged on the blade into which the shank of a bit is in-

serted. When the tip becomes worn, the bit can be removed and another easily inserted, thus eliminating the necessity



Stanley Replaceable Bit Screw Driver

of discarding a complete screw driver. Five alloy steel bits, two for driving Phillips type screws and three for driving slotted head screws, are available for use with the Stanley Replaceable Bit Screw Driver.



## LOW COST THREADER AND TAPPER . . .

This R & S Motor Driven horizontal hand feed machine comes equipped with either an R & S self-opening Die Head or with R & S Model "C" collapsible tap mounted on a ball bearing spindle. Work holders are designed for the job — collet type holders for round, square or hex bar stock make this a universal machine for diameters up to  $\frac{3}{4}$ ". See sample pieces to be threaded — quotation follows at once.

TAPS • DIE HEADS • BORING HEADS • SPECIAL THREADERS

**RICKERT-SHAFER CO.**

**ERIE, PA.**

worn, the  
er easily  
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Driver

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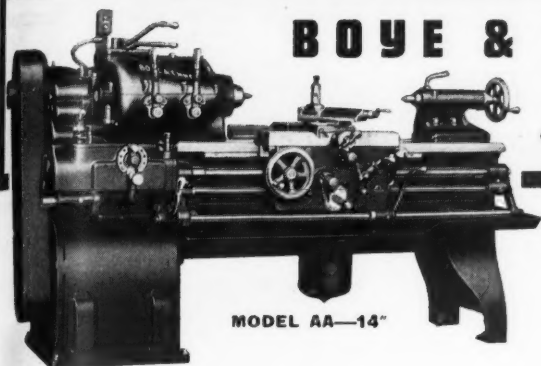
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PA

April 1940 April, 1940

# BOYE & EMMES

## Lathes



MODEL AA-14"

Write for Complete  
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sizes—from 14" to 36"—each of outstanding  
power, accuracy, range and economy.

Forty years of special-  
ized manufacture are  
behind this line of  
heavy duty lathes.  
Made in a full range of

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## HIGH SPEED METAL CUTTING MACHINES

### Hydraulic Utility Saws



Utility Saw, Wet Cut, 6"x6"

Here are moderately priced saws designed to handle  
your general shop cutting in the most efficient and  
fastest manner. These Utility saws contain those advan-  
tages of Hydraulic feed and control formerly found only  
in expensive production machine tools.

Hydraulic operation reduces moving parts to a mini-  
mum—no friction drives, ratchets, or screws to wear or  
cause horsepower loss. RACINE Utility saws prolong  
blade life because of their smooth oil-cushioned opera-  
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fastest, most accurate cutting with the least cost.

Available in two types—the Wet Cut Model and the  
Dry Cut Model—6" x 6" Capacity.

Tear out the attached coupon and get our free cat-  
alog No. 70A. You will be surprised to learn of the sav-  
ings to be made using these modern RACINE machines.

"Let RACINE Engineer Your Metal Cutting Problems"

The most complete line with

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RACINE "Shear Cut" Screw Feed Saws 6x6 to 8x8

RACINE Hydraulic "Oil Cut" 6x6

RACINE Utility Saws 6x6 and Racine Duplex Bandsaws

"STANDARD THE WORLD OVER"

**RACINE TOOL & MACHINE CO.**

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RACINE, WIS.

Please send me catalog No. 70A  
on RACINE Utility Saws. Also  
general catalog on complete line.

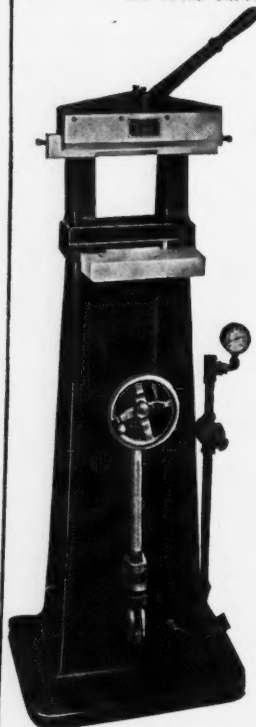
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Company.....

Street.....

City..... State.....

**YOUR PRODUCTS  
ALWAYS  
IDENTIFIED  
IF PERMANENTLY  
MARKED  
IN THIS MACHINE**



**MARKING  
BY ROLLING  
IS FAST AND  
ECONOMICAL.**

**PRESERVES  
DIE LIFE AND  
PIECE PARTS.  
REQUIRES  
ONLY FRACTION  
OF  
APPLIED  
PRESSURE  
AS COM-  
PARED TO  
STAMPING.**

**QUICK  
SET-UPS**

**MODEL 25  
HI-DUTY  
MARKING  
MACHINE**

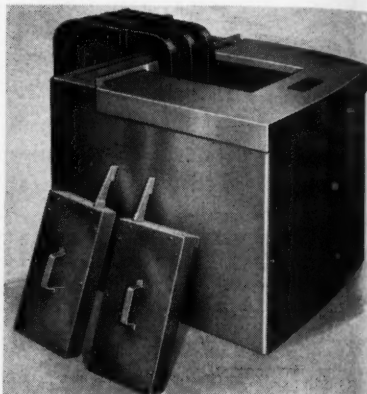
This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

**GEO. T. SCHMIDT, Inc.  
1806 BELLE PLAINE AVE.  
CHICAGO, ILLINOIS**

**Holden Three-Phase Electrode  
Furnace**

Illustrated herewith is a three-phase electrode furnace designed to employ vertical individual adjustable electrodes which has been placed on the market by The A. F. Holden Company, New Haven, Conn. Electrodes up to 30 in. in length may be used on the narrow width of this furnace.

The cover plate for loading or un-



**Holden Three-Phase Electrode Furnace**

loading is designed to drain any bath back into the furnace, this construction permitting loading from three sides. Hand-operated covers are used for overnight shutdowns or for small individual loads. A new type of flexible cover which permits use while work is in process and which is said to reduce heat input by 50 per cent is in process of development.

**Scherr "Magne-Blox" Set**

The George Scherr Co., Inc., 130 Lafayette St., New York, N. Y., has placed on the market a set of magnetic parallels and V-blocks for use with magnetic chucks to be known as "Magne-Blox." Made of alternate laminations of brass and specially selected iron of high magnetic capacity, the Magne-Blox set consists of two parallels measuring 1 x 1 1/2 x 3 3/4 in. and two V-blocks measuring 1 1/4 x 2 1/2 x 1 1/2 in., furnished complete in a hardwood case.

The Magne-Blox set is intended espe-



## NEW INTEGRAL DRIVE PRECISION BENCH LATHE

(Patented)

First tool of its class with built-in motor and speed-changing mechanism, entirely eliminating mill-wrighting. Nothing under bench — Nothing overhead. Drive integral with the lathe itself. Marvelous compactness. Any powerful vibrationless speed at a turn of the hand wheel in front. Belted and wired, ready to run. Priced at only slightly more than other precision lathes with separate, complicated drives. Two splendid sizes. (Colored Bulletin J).

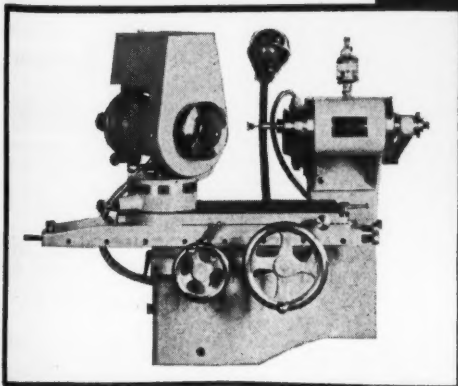
Also Stark Standard Precision Lathes, 6 sizes,  $\frac{1}{4}$ " to  $1\frac{1}{4}$ " capacity and up to 12" swing; with complete equipment. Stark Spiral Bench Millers, the most accurate of their type.

Stark Tool Co. Est. 1862 Waltham, Mass.

*Originators of the American Bench Lathe*

# BERGRAM

## Bench Type INTERNAL GRINDER IG-1



An accurate grinder suitable for set-ups that require quick changes for straight, tapered and beveled holes or for single-purpose production. Diamond dresser automatically controls selected hole size.

By changing spindles, this model grinds all sizes of holes from  $3/16$ " to 3".

*Write for complete details*

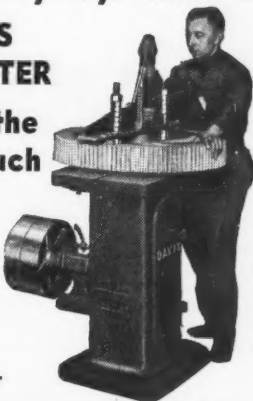
**BERGRAM**  
Mechanical Engr. Co., Inc.  
NEW BRITAIN • CONN.

## Why Use A Shaper to cut Keyways when a

**DAVIS  
KEYSEATER**

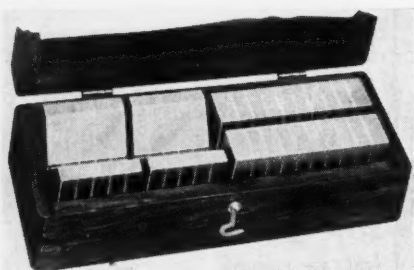
will do the  
job so much  
quicker  
and  
better?

Send  
for  
Circular



**DAVIS KEYSEATER CO.**

Exchange and Glasgow Sts.  
ROCHESTER, N. Y.



Scherr "Magne-Blox" Set

cially for surface grinding operations on odd pieces, irregularly shaped dies, jigs, and fixtures, cylindrical work, and numerous diversified forms which, because of their unusual construction, cannot be held directly on the face of a magnetic chuck. The parallels and V-blocks are placed on a magnetic chuck and obtain their magnetic properties directly from it. Because of their unusually high magnetic capacity, the parallels and V-blocks possess great holding power and are said to grip

workpieces with practically the same force as though the pieces were directly on the magnetic chuck. Magne-Blox are designed to save time on difficult setups and, in many instances, eliminate the use of various clamps and holding devices.

## Lincoln Hard-Facing Electrodes

The Lincoln Electric Co., Dept. E-8 Cleveland, Ohio, announces two hard-facing electrodes to be known as "Faceweld No. 1" and "Faceweld No. 12." These electrodes are made of cast abrasion-resisting alloys and are used for hard-facing by the metallic arc process. Both are coated electrodes, having desirable arc characteristics, and thus produce smooth, dense deposits. Deposits of weld metal are highly resistant to abrasion but are not excessively hard or brittle. Faceweld is said to bond well with all types of ferrous alloys.

Faceweld No. 1 is a general purpose hard-facing electrode and is the softer of the two Facewelds. It has high abrasion and impact resistance for the composition of material of which it is made

## MURCHEY TANGENT CHASER DIE HEADS

Self-opening.

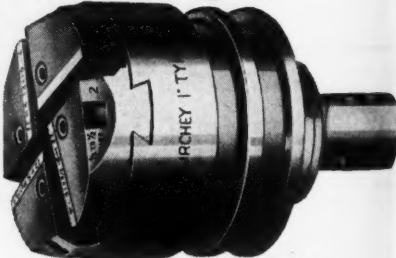
Long life, permanent throat, accuracy, interchangeability of chasers.

Positive opening and accurate closing is accomplished by four rugged cam prongs.

Furnished in rotating or non-rotating types.

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TYPE "T-C"  
(ROTATING)



ALL STYLES OF "COLLAPSIBLE  
TAPS" AND "BOLT AND PIPE  
THREADING MACHINES."

**MURCHEY MACHINE & TOOL CO.** DETROIT • MICHIGAN

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Manufactured by  
**AUTO MOULDING  
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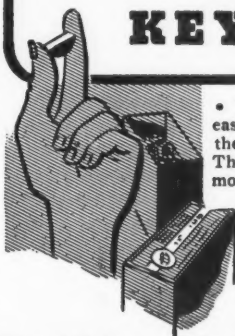
*Quicker assembly . . .*

*Lower cost with*

**WHITNEY**

*Woodruff*

**KEYS**



• Whitney keys are easily fitted — because they're accurately made. That means time-saving, money-saving assembly of shaft and keyed member. Yet Whitney keys reach deep in the shaft, stand greater strain, can't roll over. Write for Catalog V-111 and price list.

**The Whitney Chain & Mfg. Co.**  
HARTFORD • CONNECTICUT

# INTEGRITY!

T & S Rivets are the last word in dependability and uniformity. And they're backed by the long-established integrity of the Tubular Rivet and Stud Company. So remember — for complete confidence in your production charts — specify only T & S Rivets.

## TUBULAR RIVET & STUD CO.

*World's Largest Manufacturer of Tubular  
and Split Rivets*

WOLLASTON,

MASSACHUSETTS



Faceweld No. 1 can be used for surfacing by arc welding such parts as digger teeth, scarifiers, grader blades, cement plant machinery, and so on.

Faceweld No. 12 is somewhat harder than Faceweld No. 1 and has superior resistance to abrasion. The resistance to impact, however, is not quite as high as that of Faceweld No. 1. Faceweld No. 12 is also applied by arc welding. Applications include screw conveyors, conveyor sleeves, plows, gyratory crushers, power shovel and dragline bucket parts, dredge pump impellers and casings, coal pulverizer jaws, cement mill machinery, and so on.

The hardness of both electrodes varies somewhat, depending upon the conditions under which they are applied but, in general, is within the range given below.

**Faceweld No. 1**

Single layer hardness,  
approx. 45 to 52 Rockwell C

Multiple layer hardness,  
approx. 52 to 57 Rockwell C

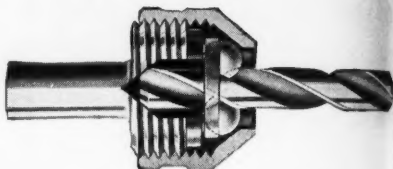
**Faceweld No. 12**

Single layer hardness,  
approx. 52 to 58 Rockwell C

Multiple layer hardness,  
approx. 55 to 59 Rockwell C.  
Faceweld No. 1 or No. 12 is furnished in  $\frac{1}{4}$ -in. diameters, 12 in. long, and is packed in 5 and 10-lb. containers.

### Park Chuck for Broken Drills

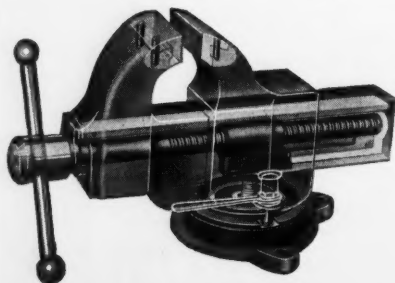
Small tool expense can now be reduced through the use of a chuck especially designed to hold small broken



Park Chuck for Broken Drills

drills, where the break comes near the tang of the drill. The chuck, made by R. H. Park Manufacturing Co., 500 Bellevue Ave., Detroit, Mich., is designed so that the fluted section of a drill can be held by steel balls which

## ONLY PARKER HAS Built Vises for 108 Years



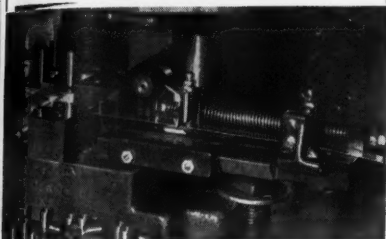
You've got to look for more than "just a vise" when you make replacements in your plant... you need a vise that stands the gaff after years of tough usage and still produces more accurate work and one that will increase production as well.

PARKER have been MASTER VISE MAKERS since 1832 and in these one hundred-odd years are packed four generations of experience... experience that is passed on to you in the form of a vise that combines construction features to better serve you for years without expensive replacements.

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THESE FEATURES WILL BE FOR-  
WARDED ON REQUEST.**

**THE CHARLES PARKER CO.**  
MERIDEN • CONN.

## DICKERMAN HITCH FEED



Adaptable to any ordinary punch press without press alterations. Feeds from any position on any style die. Quick set-up—economical for short runs.

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**H. E. DICKERMAN MFG. CO.**  
284 Wilbraham Rd. Springfield, Mass.

## NAILS · RIVETS · SCREWS MADE TO ORDER IN ANY METAL



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*Products*  
CLAY & OAKLAND STS.  
BROOKLYN, N.Y.

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WILL BE  
READY  
SOON**

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Illustrated Catalog

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**FREE  
SAMPLES!**  
BRISTO SOCKET SCREWS

for a convincing demonstration of the faster, easier, tighter set-ups Bristos give you. An eye-opening experience awaits you... one that will give you a new slant on socket screw performance. And it won't cost you a cent! Just mail in the convenient coupon printed below.

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In return, we will send you an ample supply of Bristo Socket Screws and Wrenches, in standard sizes. First, notice how the fluted wrench locks tight in the socket. No wobble. No excess play. Then, watch how tight a Bristo can be turned up... Now, back it off and re-tighten. No damage to socket walls,—no slipping wrench, no stripping, no rounding out. That's Bristo's performance, which means stronger construction, faster assembling, saving in labor, time, money,—advantages that you will want to cash in on.

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Send in this coupon for your free samples and helpful bulletin 83-8K. The Bristo Company, Mill Supply Division, Waterbury, Conn.

### QUICK BRISTO FACTS

Lock-tight socket head, won't split, shear, round out, jam or strip... Set tighter with less effort... No loosening under vibration. Take wrench without fumbling... or skidding.

**BRISTO**  
SOCKET SCREWS



THE BRISTO COMPANY, Mill Supply Division  
Waterbury, Conn.

Send me sample Bristo Socket Screws and Bulletin 83-8K.

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Address \_\_\_\_\_

# BUTTERFIELD TAPS



Where thousands of tapped holes must be produced day after day to a tolerance of .001 of an inch—specify "BUTTERFIELD" Commercial Ground Taps.

## UNION TWIST DRILL CO. BUTTERFIELD DIVISION

Factories: DERBY LINE, VERMONT, U. S. A.  
Athol, Mass.; Mansfield, Mass.;  
Rock Island, Quebec, Can.

### STORES:

Cleveland	3346 Superior Ave.
Chicago	11 S. Clinton St.
Detroit	6540 Antoine St.
New York	61 Reade St.

grip the flutes of the drill and thus hold it securely and accurately.

To use a broken drill in a Park chuck the broken end of the drill is ground square on the grinding wheel and is then tapered at a 60-deg. angle, giving the drill a shape which fits into a counterbore within the chuck, centering the drill regardless of the diameter of the drill. With the balls fitting into the flutes, the nut is tightened, holding the drill securely. The chuck can be used with any machines where drills from  $\frac{1}{8}$  to  $\frac{1}{4}$  in. are used.

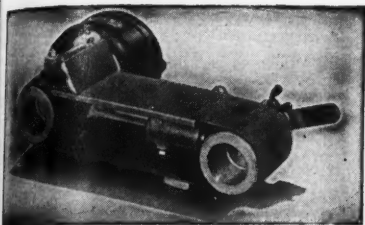
Considering that the vast majority of small holes are not deep, the saving that can be made by the use of such a tool as the Park chuck will be evident.

## Improved "Bonis" Die Mold Dressing

An improvement in the mold dressing compound known as "Bonis," which has been on the market for 12 years, has been announced by St. John X-Ray Service, Inc., 30-20 Thomson Ave., Long Island City, N. Y. Technical developments have made possible the more uniform quality in addition to the fact that it can be used for both aluminum and brass castings.

Bonis dressing is a chemical compound supplied in concentrated form which, after being dissolved in the correct amount of water, is applied by means of air pressure to hot metal surfaces of dies, molds, ingot molds, pot ladles, nozzles, and goosenecks of die casting machines. After the water has evaporated, a fine powder is said to penetrate into the minute pores and any possible cracks in the surface of the metal. When brushed evenly with a soft brush this coating is claimed to provide a perfectly smooth surface which results in a perfect surface on the casting, and which is stated to come out of the die much cleaner than if no mold dressing were used. As a result of the improved finish, it is stated that less buffing and cleaning is required before subsequent plating or finishing.

Bonis acts as a lubricator and insulator and is both non-inflammatory and non-poisonous. It is said to have an additional advantage when used on die got molds because of its deoxidizing qualities, thus resulting in at least two and one-half per cent more useful metal from such treated molds.



## NEW ABRASIVE BAND GRINDER...

*"Built Like a Machine Tool"*

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

### HORMEL-M GRINDER

WALLS SALES CORP.  
96 WARREN ST. NEW YORK, N. Y.

## NEW LACEY Universal Die Set Machine

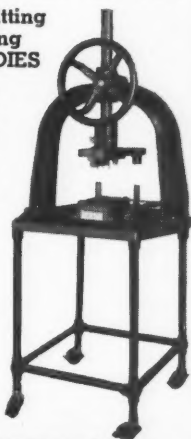
For Aligning, Fitting and Transporting PUNCHES and DIES

Quick and accurate alignment of Punch and Die Holder assures proper set-up by eliminating jamming of punch holder on pillar posts.

No Side Strain  
No Jamming  
No Breakage

Die Sets can be separated easily without use of pry-bars or hammer. Machine can be used for shearing-in certain types of die-sets.

Write for full details and low price.



### MARBURG BROTHERS, Inc.

90-96 WEST ST. NEW YORK, N. Y.

## PROFIT ON ALL WELDING, BRAZING AND HEATING JOBS

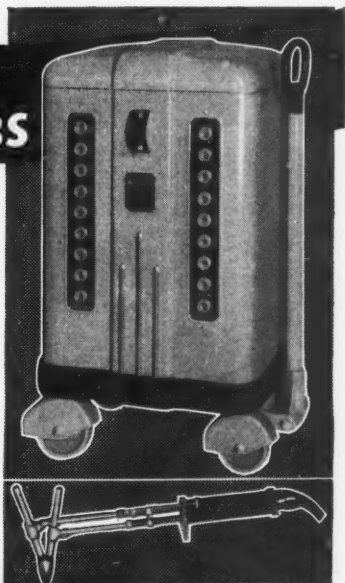
WITH THE MARQUETTE COMBINATION

### MARQUETTE A.C. ARC WELDER

Welding jobs can be done quicker and at a bigger profit with one of Marquette's eight models. Characteristics peculiar to alternating current plus the absence of "magnetic blow" assure sound, strong, ductile welds. Marquette A.C. Arc Welders are inexpensive to operate (power savings up to 15% over comparable D.C. machines—idles on 5% of regular power consumption), have negligible maintenance costs (no moving parts to wear—no gadgets to get out of order) and are low priced—\$98 to \$498.

### MARQUETTE A.C. ARC TORCH

Now you can do such jobs as non-ferrous welding, brazing, soldering, preheating, etc., with your A.C. welder plus a Marquette Arc Torch. Most jobs requiring an independent, easily-controlled source of heat can be done at a fraction of the cost of other methods. Priced complete at only \$24.75.

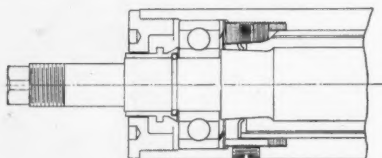


MARQUETTE MANUFACTURING CO., INC.

MINNEAPOLIS, MINN.

## Preload Adjustment for Bearings of Dumore Quills

To ensure long bearing life and precision performance at a wide range of speeds, The Dumore Company, Dept.



Drawing Showing Preload Adjustment for Bearings of Dumore Quills

180-C, Racine, Wis., has developed a preload adjustment for the ball bearings of Dumore quills. This adjustment is designed to compensate for expansion of the quill shaft caused by heat.

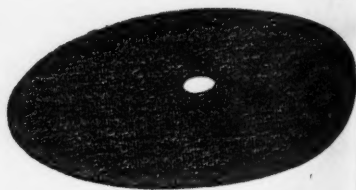
The preload spring formerly was located on the outer edge of the outer bearing raceway in the Dumore quill. At the wheel end of the quill, the outer bearing raceway was locked so that the

shaft expanded longitudinally. When this expansion occurred, the heat was greater at the quill shaft than on the outer quill tube. As the quill shaft expanded, the preload spring increased the load on the bearings. Thus a severe strain was placed on the bearings when the quill shaft was operated at high speeds.

With the present arrangement, the amount of preload is determined by a short, stiff spring adjusted by means of an internal nut in the quill tube. With the preload spring located on the inside edge of the outer bearing raceway, the pressure due to expansion is counteracted by the spring so that now the pressure on the bearings decreases at high speeds and increases at low speeds. The new preload spring arrangement permits the bearings to run freely, operating at high speeds with a minimum amount of wear. For this reason, quills which can be operated at a wide range of speeds are capable of doing precision work to closer tolerances.

## "Silver-Streak" Insulated Grinding Disc

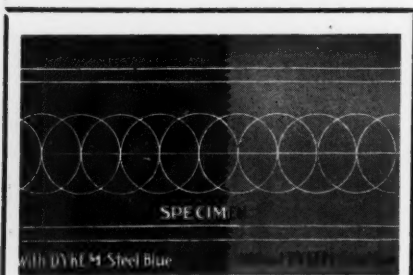
Ability to stand up under high temperatures generated in grinding is claimed for the "Silver-Streak" Insulated Grinding Disc made by Abrasive Prod-



"Silver-Streak" Insulated Grinding Disc

ucts, Inc., South Braintree, Mass. The unusual heat resistance of the product results from a new, exclusive binder developed by the company. Unlike ordinary glue which quickly softens and destroys a disc as heat is generated, this binder stays firm and holds grit in cutting position at temperatures up to 1,800 deg. F.

The "Silver-Streak" Insulated Disc also possesses an advantage in its cutting; laboratory tests have shown a special Aluminum Oxide grit capable of



## DYKEM STEEL BLUE STOPS LOSSES making dies & templates

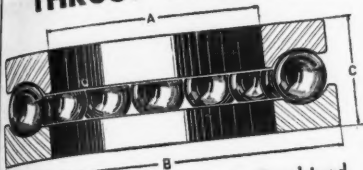
Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

*Write for full information*

**THE DYKEM COMPANY**  
2301 F North 11th St. • ST. LOUIS, MO.  
(In Canada: 3194 Dundas St. W., Toronto, Ont.)

# GWILLIAM

## THRUST BEARINGS

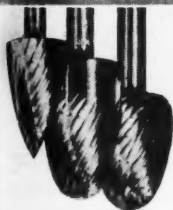
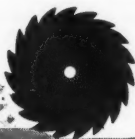


Type CC—Designed to Take Combined THRUST and LIGHT RADIAL LOADS

- Especially adapted for slow speed and heavy thrust duty, such as marine rudder posts and similar installations. To order only — any quantity.

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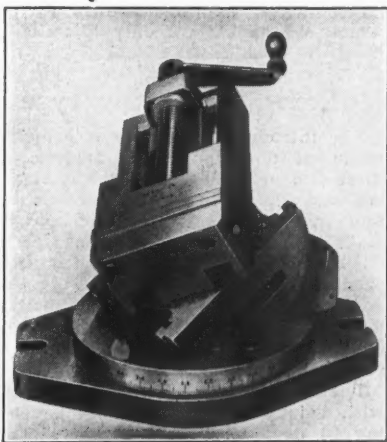


**CUTS  
CLEAN  
SHARP  
CHIPS**

Because Severance Midget Milling Cutters are hardened and drawn to 63-65 Rockwell — and then ground from the solid — they cut clean, sharp chips. Severance Midget cutters, tube boring cutters and chatterless countersinks reduce finishing time up to 75% on scores of metal, rubber or plastic products. Send us your problem or write for Catalog.

**Severance Tool Manufacturing Co.**  
1116 East Genesee Ave. Saginaw, Mich.

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## The WESSON <sup>all steel</sup> UNIVERSAL VISE

Gives you faster set-ups and greater accuracy. No more tedious or makeshift measuring. Accurately graduated in all planes. Sturdy cradle design and all-steel construction give greater rigidity; permit faster stock removal. Two sizes, priced for every shop. Also furnished with slotted surface plates.

**Mill Supply Distributors:** Several profitable territories available.

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**WESSON CO., 1050 Mt. Elliott, Detroit**  
Please send me Illustrated Folder covering the Wesson Universal Vise.

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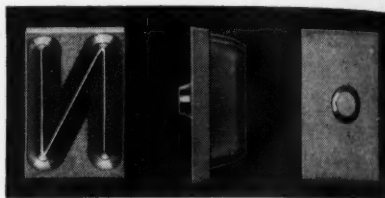
at least a 25 per cent increase in production. This prevention against softening, filling or glazing has shown unusual results in factory tests. In one test, the disc completed 32 units of work as compared with discs formerly used which are capable of only 17 units.

## Preis Master Copy Type

The introduction of master copy type made of durable plastic material for three-dimensional pantographic engraving and die-cutting machines has been announced by H. P. Preis Engraving Machine Co., 157 Summit St., Newark, N. J. The type is intended for use in producing steel letter stamps, type, and various classes of dies. It is furnished in heights of  $\frac{1}{8}$ ,  $\frac{1}{4}$ , and  $\frac{1}{2}$  in. and in eight variations of width, from very condensed to very extended widths.

The face of the character is formed with a double bevel, the lower bevel being 20 deg. from center line and the upper bevel, 35 deg. Because of the steepness of the lower bevel, the base of the character is relatively narrow,

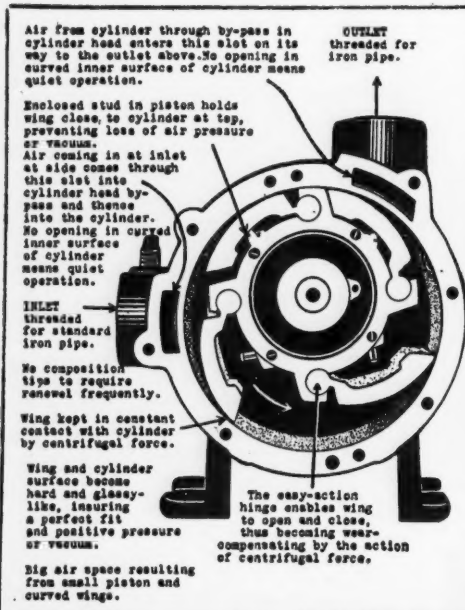
thus permitting very close spacing. The greater angle of the upper bevel is said to provide a strong structure, preventing breakage and retarding wear. For ease of lining up, a stud projects from



Preis Master Copy Type

the back of the character as shown in the illustration.

The contours of the letters and figures and the space distribution have been very carefully worked out for pleasing appearance and practical readability. The manufacturer states that the use of Preis master copy type eliminates necessity for hand finishing. Side walls of any angle of 35 deg. or over



## LEIMAN BROS. PATENTED HIGH PRESSURE BLOWERS AND VACUUM PUMPS GAS BOOSTERS AIR MOTORS

For Gas Furnaces -- Blow  
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Gas Machines -- Atomizing --  
Agitating -- Vacuum Printing  
Frames -- Paper Feeding --  
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Devices.

**SENT ON TRIAL!**  
They Take Up Their Own Wear  
**LEIMAN BROS.** 3W-23 WALKER ST.  
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Makers of Good Machinery For Fifty Years

## WHITNEY-JENSEN TOOLS



**No. 5 JR.  
PUNCH**

Will punch  $\frac{1}{4}$ " hole in 16 gauge. Available in a paper carton or in a metal box, with seven punches and dies.



**No. 10  
PUNCH**

Capacity  $\frac{3}{8}$ " hole through  $\frac{1}{4}$ " iron. Wt.  $\frac{1}{4}$ " lbs.



Write for catalog on complete line.

**Whitney Metal Tool Co.**

110 FORBES ST.

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## NEW and INFORMATIVE



### CATALOG NUMBER 3 OF KENAMETAL TOOLS BLANKS

Completely describes 20 standard style KENAMETAL tools for machining steel and other metals. Includes practical information on care and use of carbide-tipped tools. Sent free to those requesting it on company letterhead.

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## You Name The Collet



### ... WE'LL SUPPLY IT!

At the Modern Collet plant, complete information is listed for approximately 7500 different collets. When you require a certain type of collet—particularly one that is not generally used—it is not necessary for you to submit any details to us other than those concerning the machine on which it is to be used. Our records will show us exactly what you need—and it will be delivered to you without delay or error.

Thousands of standard screw machine, lathe and milling machine collets are carried in stock at all times. Regardless of type or quantity, deliveries on standard items can always be made promptly.

If you have a special collet problem, the experience and facilities of Modern Collet are always at your disposal. With a background of years of specialization in the manufacture of collets, we are in a position to ALWAYS furnish you what you want... when you want it... and at the right price.

Our New Catalog Listing All Collets and Other Screw Machine Replacement Parts and Tools Is Just Going to Press. Reserve Your Copy Today.

**MODERN COLLET  
AND MACHINE CO.**

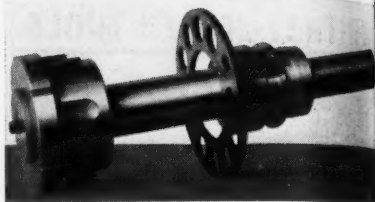
401 Salliotte St.

Ecorse, Mich.

from center line can be obtained by using a tracing stylus and cutter with corresponding angle. For straight-line work, the characters are placed in standard beveled grooves. For circular, curved, or angular arrangements, the back studs are engaged in a tapered groove which is cut into a plate or board to follow the desired alignment. When properly arranged, the characters are then cemented in place.

### Geometric Special 8-In. Class S Collapsing Tap

Illustrated herewith is a special 8-In. Geometric Class S Collapsing Tap, designed for cutting eight threads per inch in holes ranging from  $8\frac{1}{2}$  to 10 in. in diameter, which has been brought out by The Geometric Tool Co., New Haven, Conn. Primarily, the tool is a lengthened tap which has been equipped with roller pilots for use in tapping deep holes in massive castings used in marine equipment. In addition, the tool has a special adjusting ring which enables it to make both the rough and

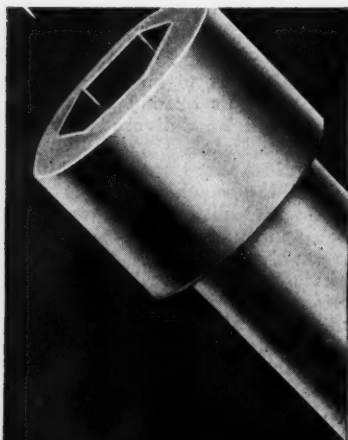


Geometric Special 8-In. Class S Collapsing Tap

finish cuts. In general design, however, the tool is similar to the regular Geometric Class S Collapsing Tap.

### Stanley No. 153 Grinder

Stanley Electric Tool Division, 127 Elm St., New Britain, Conn., has announced a compact grinder, designated as the No. 153, which is nicely balanced and designed for both hand and lathe grinding. With a motor holder, the grinder can be mounted in a lathe, milling machine, or shaper for external or



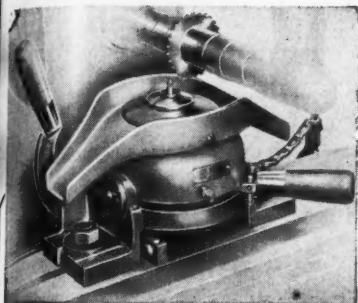
### MAC-ITS Save on Production, Maintenance and Design!

Stronger, more accurate screws can end many tie-ups—save labor and replacements—and cut costs all along the line when your designs take advantage of their greater strength.

Mac-its give you all these savings in 16 standard items. For complete details, call your Mac-it distributor or write today for your copy of Catalog 38, listing the only complete line of heat-treated, alloy steel screws!

1

**THE STRONG, CARLISLE & HAMMOND CO.**  
1392 West Third St., Cleveland · Ohio



## DEARBORN Automatic Chucking and Indexing Fixture MILLS OVER 1000 PARTS PER HOUR

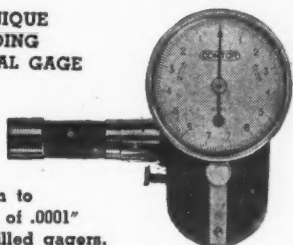
Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

**J. W. DEARBORN**

70 S. CLIFF ST. • ANSONIA, CONN.

## New Bulletin, on COMTORPLUG

THE UNIQUE  
EXPANDING  
INTERNAL GAGE



Precision to  
fractions of .0001"  
by unskilled gagers.

Here is the ONE gage that gives positive precision measuring bores to fractions of .0001". Self centering and aligning; not a passing reading; prevents variations of human element. Sizes 1/4" to 7" and larger. Request newly issued - -

BULLETIN 27

**THE COMTOR CO.**  
WALTHAM, MASS. EST. 1928

## CAD Standardized set-up appliances

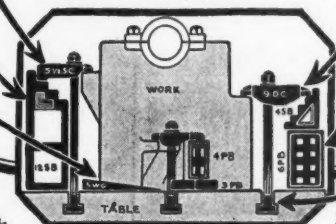
WHY FORCE YOUR MEN TO WASTE TIME on machine-tool set-ups when CAD Standardized Appliances will convert this non-productive time into productive labor? WHY RUIN MACHINE TABLE-SLOTS with ordinary bolts when CAD Bolts are designed to fit T-slots? Ask for CAD Folder A-57.

CARRIED IN STOCK: Detroit, Chas. A. Strelinger Co.; Cleveland, Cleveland Tool & Sup. Co.; Chicago, H. Channon Co.; Indianapolis, Vonnegut Hdw. Co.; Buffalo, Beals, McCarthy & Rodgers; St. Louis, Colcord-Wright Mch. & Sup. Co.; New York, Franklin Hdw. Co.; Newark, Squier, Schilling & Skiff; Cincinnati, E. A. Kinsey Co.; Los Angeles, Almquist Bros. & Viets; San Francisco, C. W. Marwedel Co.

STANDARD SHOP  
EQUIPMENT CO.

Set-up appliances for  
machine tools.

1177 Tincum Ave., Philadelphia, Pa.



Bridgeport,  
Hunter & Havens' Co.  
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● Careful selection of materials, close study of modern heat treating, and rigid inspection of each tap before it leaves the plant, enable Threadwell to produce taps for long life, for accuracy and for dependability.

Those tough, hard, long tapping jobs require Threadwell Taps.

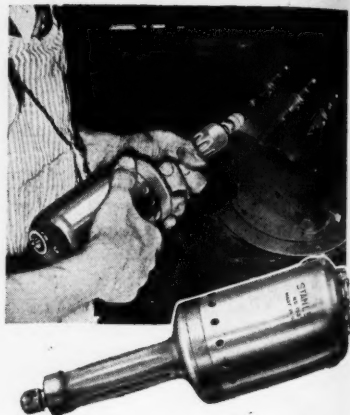
Send for Catalog No. 10 describing the complete Threadwell line.

**THREADWELL TAP & DIE CO.**  
GREENFIELD • MASS.

internal grinding on dies, punches, machine parts, spiral cutters, and so on.

The motor is a  $\frac{3}{8}$  h.p. direct drive unit mounted on ball bearings and has ample power to drive grinding wheels up to  $1\frac{1}{2}$  x  $\frac{1}{2}$  in. The motor unit is air cooled and is housed in an alloy steel shell, finished bright chromium. The spindle housing is fully enclosed and fluted for comfortable grip.

The extended shaft gives a reach of 5 in. for deep internal grinding and the



Stanley No. 153 Grinder

long spindle housing provides a good grip for hand grinding. The No. 153 Grinder will accommodate emery wheels, mounted points, and rotary files for hundreds of jobs.

The no load speed is 18,000 r.p.m. The grinder is  $11\frac{1}{4}$  in. long and weighs without cord, 5 pounds.

### B & S Hole Attachments Nos. 729C and 729D

Two hole attachments, designated as the Nos. 729C and 729D, have been added to the line of machinists' tools manufactured by the Brown & Sharpe Mfg. Co., Providence, R. I. These attachments are designed for use on dial test indicators having stems 0.375 in. in diameter, adapting the indicator for testing internal and other surfaces which cannot be reached with the spindle of

Lubricator    Regulator    Filter

Stimulate your  
**AIR TOOLS**

Look what this low-cost outfit does to your air!

The filter removes scale and moisture. The regulator removes jitters — assures even pressure. The lubricator oils it. Result: Clean, oiled air, at proper pressure—better, more economical performance of air tools. Three items available as shown, or separately. Ask about new low prices.

**C. A. NORGREN CO., INC.**  
216 Santa Fe Drive      Denver, Colo.

# Gammons

## REAMERS AND END MILLS

ORIGINATORS of the  
Helical Taper Pin Reamer  
Special Reaming Problems Invited  
Immediate Shipment on Stock  
Tools

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THE GAMMONS-HOLMAN CO.      MANCHESTER, CONN.

# A CLAMP For Every Purpose

**Forged Steel**  
**Quick Acting**  
**Deep Reach**

**Sizes Available:**  
 $\frac{3}{4}$ " to 10' opening  
 $\frac{1}{2}$ " to 16" deep

Write for CATALOG and PRICES on Clamps for all purposes as well as many other tools for use in the Machine Shop.

IN STOCK AT YOUR SUPPLY HOUSE

**The Cincinnati Tool Co.,**      1947 WAVERLY AVE.,  
CINCINNATI, OHIO

the dial gage. The gages can be easily and quickly attached and are held firmly in position by means of a knurled clamp screw. Any looseness or play in the arm is eliminated by means of an adjustable fulcrum screw.

The B & S Hole Attachment No. 729C



B & S Hole Attachment No. 729C

shown herewith is suited particularly for use in deep holes and will enter a hole to a depth of  $1\frac{1}{8}$  in. Hole attachment No. 729D, while similar in construction to the No. 729C, has a shorter arm which will enter a hole to a depth of  $\frac{3}{8}$  in. This type of attachment is suitable for use in shallow holes or for rough grinding and boring operations, since with the shorter arm the tendency to chatter is reduced. The arms of both attachments are  $\frac{1}{2}$  in. in diameter and are hardened.

## Flexible Filter Folders

To simplify the operation of industrial X-ray equipment, St. John X-Ray Service, Inc., 30-20 Thomson Ave., Long Island City, N. Y., has brought out a flexible filter folder for use with such equipment. The folders are designed for use for films from 2 x 5 in. to  $4\frac{1}{2}$  x 17 in. in size and for steel thicknesses of  $\frac{1}{4}$  to above 4 in. The filters are intended to be used with Patterson industrial intensifying screens.

## Pittsburgh Segment Saw

Recognizing the need for a fine pitch segment saw, Pittsburgh Saw & Tool Company, 77 Sycamore St., Pittsburgh, Pa., has developed a segment saw in which the segments are held in place by means of wedges. The segments are rigidly secured by tongues and grooves, as well as by a key and heavy wedge, which together are said to make the saw as substantial and sturdy as though solid.

The segments are driven by the full width of the saw body. The blades of the Pittsburgh Segment Saw are of spe-

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**Five-Point  
Deephard on**

**WHEN PARTS WEAR AND BREAK,  
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A 60,000 R.P.M. Unit



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SPECIAL GREASE SEALED BEARINGS  
NO LUBRICATION REQUIRED.

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OTHER MODELS, ALSO AIR LINE FILTERS  
AND AUTOMATIC AIR LINE LUBRICATORS.

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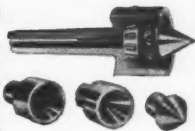
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Export Office: 44 Whitehall St.  
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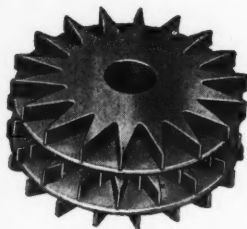
Low in cost—it is adaptable to an endless variety of centered and uncentered work on all types of machine tools. Speeds production, improves quality.

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## DESMOND

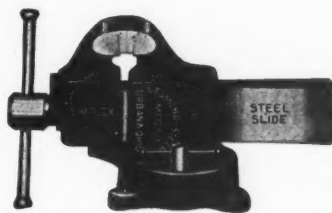
DRESSERS · CUTTERS



We manufacture the only complete line of grinding wheel dressers and cutters. Write for catalog "M" and name of your nearest dealer.

## SIMPLEX

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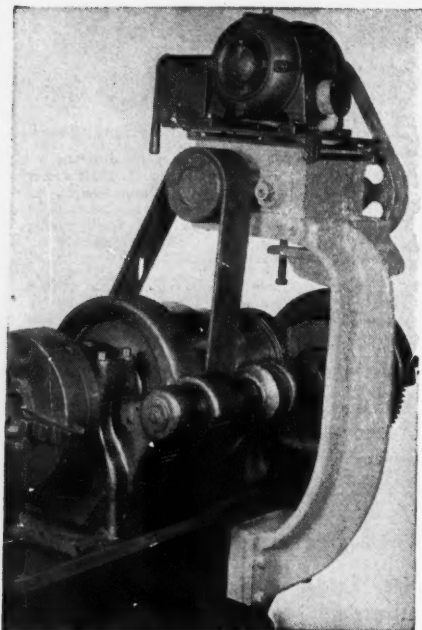


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No one drive meets all requirements advantageously.

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We offer:

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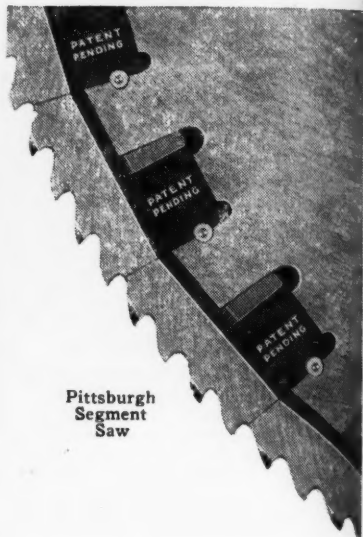
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cial alloy steel scientifically heat treated by a special process, resulting in further exceptional strength and durability. The segments are of high speed steel, heat treated and ground by precision methods.

The saw is made in 24 standard di-



**Pittsburgh  
Segment  
Saw**

ameters from 14 to 60 in. with from 15 to 45 segments in the saw, depending on diameter.

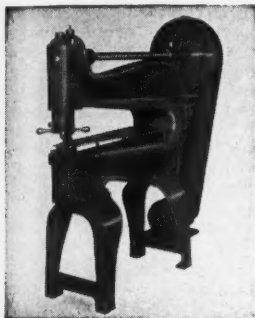
## Westinghouse Wall and Floor- Mounted Air Heaters

A line of wall and floor-mounted air heaters constructed to solve heating problems for specific applications is announced by Westinghouse Electric & Manufacturing Company, Mansfield, Ohio. The ease of installation and clean, steady, odorless heat are said to make these units particularly desirable for use in crane cabs, truck houses, valve houses, locomotive cabs, scale rooms, and garages. They are designed for use with either a three-heat hand switch or a Westinghouse Type AA thermostat.

The wall-mounted air heaters range from 25 $\frac{1}{2}$  to 31 $\frac{1}{2}$  in. in length and are from 10 $\frac{1}{2}$  to 16 $\frac{1}{2}$  in. high. They have a

## SAVAGE NIBBLING MACHINES

Powerful Direct-Over-Center Drive  
Totally Enclosed Revolving Head



A Modern Sheet Metal Cutter for Modern Sheet Metal Shops.  
Capacities to  $\frac{3}{4}$ ". Throat depth to 36".

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234 Sizes  
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Springs from stock in 234 sizes ranging in length from  $\frac{1}{4}$  inches to 24 inches; in diameter from  $\frac{1}{16}$  to 4 inches; in wire size from .016 inches to .500 inches.  
Listed on new SPRING PAGE with complete technical data on each individual spring.



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105 RICHMOND ST. • BOSTON, MASS.  
MACHINE PARTS...preferred sizes from stock

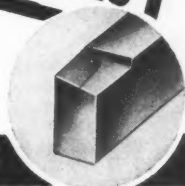


*75% production increase!*

**NO WONDER** progressive machine shops are earning extra profit

Floor-to-floor time cut 30%...tool life up 200%...production increased 75%. Big figures, yet it's happening every day, report machine shops using Teco — the New Carbide Cutting Tool for steels.

Teco's Carbide composition, developed by long experienced carbide tool designers, has amazing strength, is almost diamond-hard. This toughness accounts for the longer tool life and more continuous per-hour production users of Teco enjoy. Investigate Teco today. It gives you not only more pieces per grind of tool, but produces a smoother, more accurate finish. Write for particulars, to Tungsten Electric Corporation, 540 - 39 Street, Union City, New Jersey.

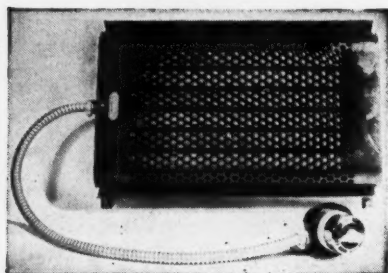


**CARBIDE TOOLS**

April, 1940

MODERN MACHINE SHOP 213

rating of 1,000 to 4,500 watts and operate on 115, 230 or 440 volts. The floor-mounted air heaters have approximately the same heating surface in inches and



Westinghouse Air Heater

the same wattage rating as the wall-mounted units, but they are only made to operate at 115 or 230 volts.

Formulae to determine the proper size heater for individual installations may be obtained from the Heating Division, Westinghouse Electric & Manufacturing Company, Mansfield, Ohio.

## Aero-Thread Screw Thread System

Failures of modern high speed mechanisms such as the high speed engines employed for automotive and aviation uses, where parts are subjected to intense vibration and repetitions of stress, have frequently been found to be due to inability of bolts and screws to withstand the stresses to which they are subjected. In other words, the screws have been shown to have low fatigue capacity and poor shock resistance. Fatigue failures are largely due to the presence of sharp corners, notches, grooves, splines, and other sudden changes in section in which concentrated stresses are developed. Threads of the standard "V" type comprise a good example of fatigue failure due to stress concentration, which is set up at the root of the thread.

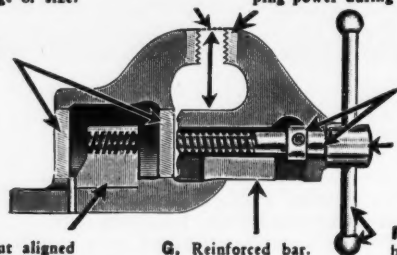
To eliminate failures due to thread design, the Aero-Thread Screw Thread System has been developed. The outstanding feature of this system is a thread lining which consists of a precision shaped spring wire insert which is employed between the tapped hole

# The A-B-C's of HOLLANDS VISES

**B.** Liberal depth of jaw gives ample capacity for work within range of size.

**A.** Wide bearings and long body construction insure rigidity and durability.

**C.** Welded tool steel jaw faces, machine corrugated, cover entire face and will not loosen or lose their gripping power during life of vise.



**D.** Large machine finished bearings between screw head and collar prevent lost motion.

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**F.** Polished steel handle and handle balls.

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## HOLLANDS MFG. CO.

## Erie, Pa.

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REDCAP gives you a special feature in its handpiece of laminated linen base bakelite with molded caps. Cool and comfortable in use. It is equipped with SKF ball bearings and No. 0 balanced Jacob Chuck with capacity of  $\frac{1}{8}$ " down to No. 80 drill.

Max. speed is 12,500 r.p.m. Flexible shaft, 37" long. Variable speed foot rheostat shown is optional. Redcap's modern features make tool room jobs go faster, easier. Write for free folder that tells you why.

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Drills  
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$\frac{1}{8}$ " H.P. Universal type motor; rubber covered cord and plug.



## OTC GRIPOMATIC PULLERS

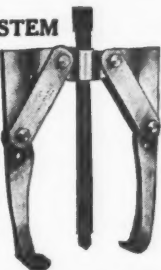
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### for PLANT MAINTENANCE

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includes many sizes and types of Pullers and Pushers for installing and removing gears, bearings, wheels, pulleys, sleeves, shafts, etc.



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Notably reduces power loss...

## (T-J) HYDRAULIC CYLINDER PISTONS are SEALED with PACKINGS

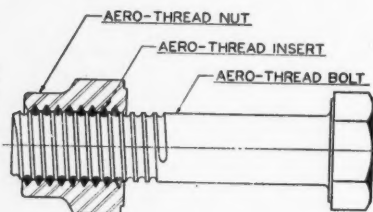
On test these cylinders show a 95% average efficiency for pressures from 500 to 2000 pounds per square inch. The packings eliminate slippage and provide as nearly as possible the theoretical exerted power.



CATALOG H-37 reports on additional construction features and complete cylinder specifications. Your copy will be sent promptly. Address The Tomkins-Johnson Co., 620 N. Mechanic St., Jackson, Michigan.

this is a **TOMKINS-JOHNSON** product

and the mating screw. This thread lining protects the tapped hole from wear and abrasion and provides an anti-friction surface between the mating threaded parts, thereby ensuring smooth screw engagement, and permits the use



Cross-Section Drawing of Aero-Thread Bolt and Self-Locking Nut

of a shallow circular section thread groove on the screw or bolt resulting in screw members of maximum static and dynamic strength.

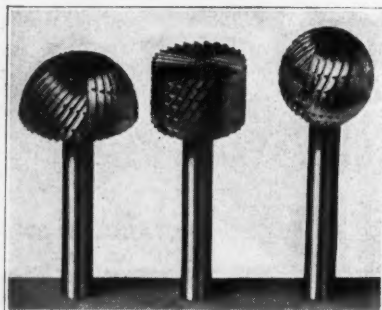
The Aero-Thread form is a shallow circular section thread form in which the diameter of the thread form circle is

0.75 times the thread pitch and the depth of the thread is 0.3 times the thread pitch. The thread form on the screw or external threaded member is produced directly by any of the usual manufacturing methods, while the thread form in the boss or internal threaded member is formed by the Aero-Thread spring wire insert that is assembled in the tapped hole.

The tapped hole thread has a truncated 60 deg. "V" thread similar in form to the American National screw thread. The pitch diameter of the tapped hole is equal to the screw diameter plus 0.4 times the pitch. The basic width of the flat at the crest of the Aero-Thread insert is  $\frac{1}{8}$  of the thread pitch and the basic depth of the tapped hole to the crest of this insert is 0.52476 times the pitch. The major diameter of the tap is sufficient to provide a clearance between the crest of the insert and the tip of the tapped hole, the basic clearance with maximum diameter tap being 0.072 p and with minimum tap being 0.036 p, where p is equal to the pitch of the thread.

The Aero-Thread has been adopted by several of the more important American aircraft engine manufacturers and a

## FORD GROUND CUTTERS



Just a few of the many standard shapes which are carried in stock.

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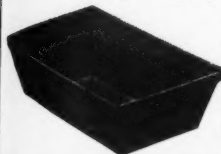


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that the life of  
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## QUALITY

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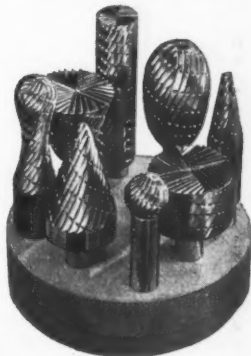
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**High Speed  
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212 N Laflin St Chicago, Ill.

SEND FOR BULLETIN CONTAINING COMPLETE DATA and LOW PRICES

number of screw manufacturers have been licensed to manufacture screws using the Aero-Thread Screw Thread System. Full information concerning the Aero-Thread, including engineering standards and technical information, are available in Bulletin T-1, which can be had by addressing Aircraft Screw Products Company, Inc., 25-12 41st Ave., Long Island City, New York.

## Haskins Redesigned Bench Mounted Flexible Shaft Machines

The R. G. Haskins Co., 619 S. California Ave., Chicago, Ill., is now marketing a line of bench type flexible shaft



Haskins Redesigned Bench Mounted Flexible Shaft Machine

machines with newly designed round bases. The newly designed bases are said to offer maximum stability and require a minimum of space on the bench. Motors are fastened to the bases by means of ball bearing swivel plates having a full 360-deg. swing.

The Haskins Redesigned Bench Mounted Flexible Shaft Machines are furnished in  $\frac{1}{4}$  and  $\frac{1}{2}$  h.p. sizes and are arranged for either single speed direct drive or multi-speed countershaft drive.

## Jackson Folding Eyeshield

An eyeshield of light weight, folding design has been announced by the Jackson Electrode Holder Co., Detroit, Mich. The shield is recommended particularly for workmen engaged in buffing, polish-

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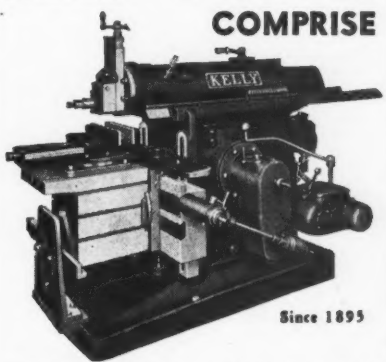
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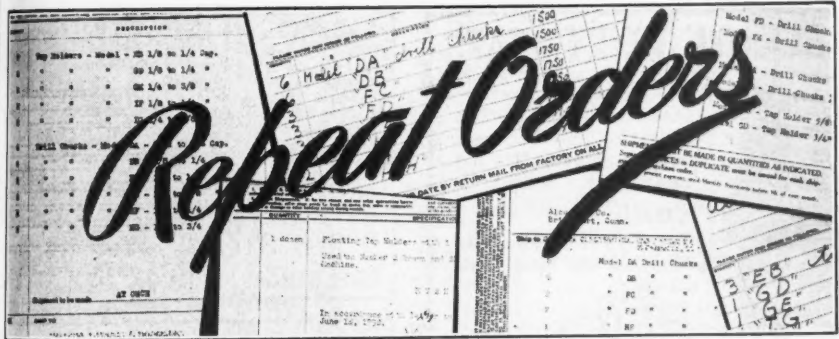


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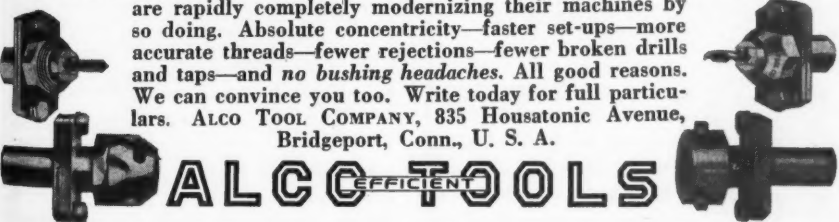


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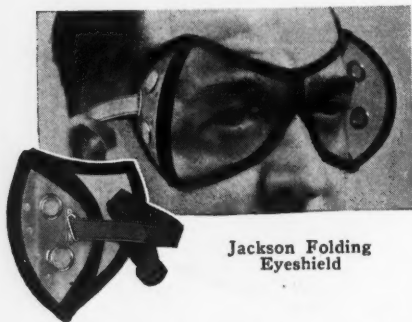
Repeat orders are the rule rather than the exception. Screw machine owners, who try ALCO Drill Chucks, Tap Holders, and Die Holders, almost invariably re-order. Many are rapidly completely modernizing their machines by so doing. Absolute concentricity—faster set-ups—more accurate threads—fewer rejections—fewer broken drills and taps—and no bushing headaches. All good reasons. We can convince you too. Write today for full particulars. ALCO TOOL COMPANY, 835 Housatonic Avenue, Bridgeport, Conn., U. S. A.



**ALCO TOOLS**

ing, and light grinding operations and woodworking, as well as for helpers around spot, flash, and gun welding machines.

According to the manufacturer, the



Jackson Folding Eyeshield

shield fits the face snugly and comfortably, provides complete eye protection, and does not interfere with prescription glasses. Wide vision is afforded in all directions through lenses of flexible, shatterproof Plastacele, and ventilation is provided through screened grommets. The shield can be folded flat and is

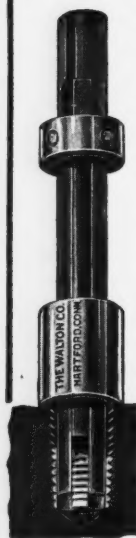
designed to fit the vest pocket.

## "PDCP" Copper

To meet the need of the electrical industry for a type of copper having greater conducting power, ductility, fatigue resistance, and surface quality, Phelps Dodge Copper Products Corp., 40 Wall St., New York, N. Y., has developed a dustless and sliverless copper to be known as the "PDCP." Made under a patented process, the copper, in addition to the above characteristics, is said to be free of imperfections which are responsible, according to engineers, for a large percentage of electrical failures. The improved metal is made without melting from electrolytic cathode copper, which is plastically converted by tremendous pressure in a reducing atmosphere at elevated temperature into smooth, dense copper bar, rod, strip, or other desired commercial shapes.

Basically of the oxygen free type, "PDCP" is said to be the only solid copper in the world which is not melted subsequent to the electrolytic purification process. Hence, the intrinsic purity of electrolytic cathode copper is not only

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### Quickly --

Insert WALTON Tap Extractor and back out broken piece. No annealing—no drilling.

### Easily --

Tap Extractor and Tap Wrench are only tools needed.

### Safely --

Threads are not damaged. Not necessary to tap oversize after broken tap is removed.

Folder 131 gives complete details.

**THE WALTON CO.**  
98 ALLYN ST.  
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**SELLSTROM MFG. CO.** 645 N. Aberdeen St. Chicago



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COMPLETE WITH HOLDER, \$4.00



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*Wasted Minutes MEAN  
Unprofitable Hours*

**DON'T LET DANGEROUS DUST AND DIRT  
SLOW DOWN OPERATIONS IN YOUR PLANT**



**1 H.P. 2 SPEED  
MOTOR**

**A COMBINATION PORTABLE ELECTRIC  
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**BLOWER & SUCTION CLEANER  
SAVE TIME AND MONEY**

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ACCURACY  
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— is assured with either a "TOLEDO"  
No. 101  $\frac{1}{4}$ " to  $\frac{5}{8}$ " capacity or a  
"TOLEDO" No. 102  $\frac{1}{2}$ " to 1" capacity.

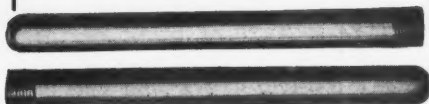
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MACHINE CO. - Toledo, Ohio**

**NEW YORK OFFICE AND DISPLAY  
72 LAFAYETTE STREET**



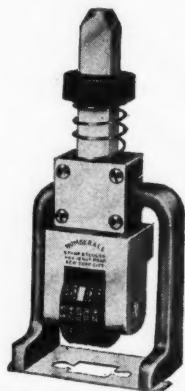
retained but is claimed to be greatly enhanced at the high temperature of the reducing gas used in the process.

"PDCP" copper has been found to give outstanding performance in high-frequency and high-voltage transformer windings and is especially adapted to high-tension and submarine cables and refrigeration and air-conditioning installations. It is also particularly applicable for service where severe vibration is encountered such as in aeroplane and electric locomotive wiring and in railway signal bond cable. The unusual ductility of this copper enables it to be

sharply bent, and easily formed or drawn.

## Numberall Model No. 49 Stamp Holder

For use with Numberall Multi-Wheel Numbering Machines Models 70 and 80 and also with Numberall Automatic



Numberall Model No. 49 Stamp Holder

Numbering Head Model No. 50, Numberall Stamp & Tool Co., Huguenot Park, Staten Island, N. Y., has brought out the Model No. 49 Stamp Holder shown in the illustration. The stamp holder is intended to hold the stamp square with the work in order to make a perfect impression. In use, the stamp is depressed until it touches the work, then a hammer is used in the usual manner to make the impression. A gage



## SAROSTON Precision Tool Room Grinder

Grinding wheels may be used on either end of spindle.

SIZES UP TO 2 H.P.

**THE SAROSTON CO.**  
251 PARK ST., UPPER MONTCLAIR, N.J.

# GEARS

## Good Gears Only

All Kinds  
Any Quantity  
AT THE RIGHT PRICE  
**THE CINCINNATI GEAR CO.**  
1825 Reading Road Cincinnati, Ohio

## THE KOCH TEST INDICATOR

The Koch Test Indicator has now added new improvements for better vision and more accuracy. The only toolmakers' Indicator on the market with two working ends. One end to test outside surfaces, the other inside.



What Every Tool Room Toolmaker, Machinist Needs

The Koch Test Indicator is constructed so that the plunger moves away from, instead of against the lever, preventing the delicate parts from being broken by a sudden or excessive jolt of the plungers. It is shock proof. Each graduation on the scale represents 1-1000 of an inch movement of the plunger. Send for bulletin. Price of Indicator \$5.00.

**THE KOCH TEST INDICATOR** Phone Nyack 2222 28 2nd Ave. Nyack, N. Y.

## THOR STAMPS LAST LONGER



You get more marks per dollar with THOR STAMPS. They're made of correctly-heated alloy steel. Central striking point gives uniform indentation. Thumb side marking makes them easily read—easily used. Write for catalog.

**THE PITTSBURGH STAMP CO.**

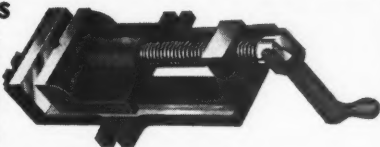
812 CANAL ST.

PITTSBURGH, PA.

## ELIMINATE SPECIAL AND COSTLY JIG FIXTURES By Using Yost Drill Press Vises

They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.

Write us for circular "H," giving us name of your nearest dealer.



**YOST MANUFACTURING COMPANY, Meadville, Pa.**

## The VERNON MILL gives you the Right Speed for every job—at the turn of a wheel!



*The Right Speed  
For Every Job*

*Just Turn  
the Wheel  
As Easy  
As That*

Features: Fully-enclosed Variable Drive giving spindle speeds from 150 to 1500 R.P.M., Timken mounted spindle with No. 9 B. & S. taper, box-type knee, can be arranged for power feed, table size 4 1/8" x 20", 12" longitudinal feed.

Built to laboratory standards for precise, economical operation, the sturdy, dependable Vernon Mill gives you accuracy, practical capacity, power, versatility and speed combined with LOW PRICE. Its handsome, modern design typifies the engineering skill used throughout to promote convenient operation, improved efficiency and lower production costs. To keep costs low, precision high, install Vernon Machine Tools. Write today for bulletin giving full details of Vernon Mills and 11" Shapers.

Dealers: Write today for exclusive territory.

**MACHINERY  
MANUFACTURING CO.**

Manufacturers of THE VERNON LINE  
of Machinery

Box 155, VERNON, CALIFORNIA

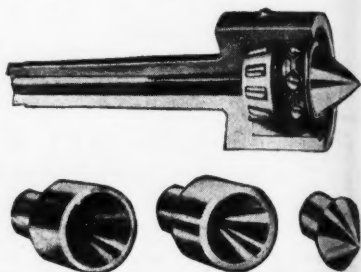
at the bottom of the device enables the operator to locate the stamp at the exact spot where the impression is to be made. The stamp can be taken out of the holder if desired.

## Ideal Live Center

Ideal Commutator Dresser Co., 1031 Park Ave., Sycamore, Ill., announces a live center with interchangeable inserts or center pieces for holding centered and uncentered work. Three inserts are available and may be used in-

terchangeably depending upon the work to be centered: (1) male insert for work already centered; (2) plain female insert for uncentered work—i. e., armatures, drills, and so on; (3) female insert with three raised lands for uncentered work having a flat or burred keyway. Inserts can be quickly removed by means of a knock-out screw.

All parts of the live center are hard-



Ideal Live Center

## PORTER cutters

**BOLT CLIPPERS** — precision built with special heat treated jaws and minimum friction loss. All sizes with capacities up to  $\frac{3}{4}$ " annealed bolts in thread or  $\frac{3}{8}$ " rod. Straight, angular, or end cut. Swivel heads to cut at various angles. Write for free catalog and metal cutting instruction book.



H. K. PORTER, Inc., Everett, Mass.



## COUPLING with Flange Design

Designed to bolt to fly wheel, brake drum or clutch, popular with Diesel operators. Saves about  $\frac{1}{3}$  usual coupling space — just one of many L-R non-lubricated types for practically every purpose. Use letterhead and write for new free catalog.

Lovejoy Flexible Coupling Co. 5007 W. LAKE ST. CHICAGO, ILLINOIS

ened and ground, and high precision bearings are used. Short overhang eliminates chatter. All cuttings, oil, dirt, and chips are kept out by sealed ball bearings.

The center is adaptable to a wide variety of centered and uncentered work and all types of machine tools such as lathes, millers, grinders, and hand screw machines.

## K. O. Lee Tap Grinding Equipment

A cutter grinder for use in tap grinding has been placed on the market by the K. O. Lee & Son Co., Aberdeen.



## If it's STUD SETTING—It's our SPECIALTY

We can supply the proper tool for all sizes and types of stud setting—from 4-40 to 3" and larger if needed. Tools that are designed for small lots or large, for all standard and special types of studs, electric, pneumatic, machine tool or hand drive.

Send us a sample stud or sketch  
• for practical suggestions •

**TITAN TOOL COMPANY • FAIRVIEW, PA.**

# SMALL GEARS

—in the finer Pitches—14 to 96 D. P.

**SPURS WORM-  
SPIRALS GEARING  
HELICALS RACKS  
BEVELS RATCHETS**

*High precision or commercial production.  
A few pieces or a million.*

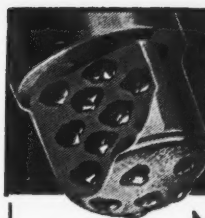
You can **SAFELY** entrust your Gear purchases to this exceptionally well equipped and organized plant.

**Made to Order Only—No stock—No Catalog**

***Gear Specialties***

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**CHICAGO**



**Free Cutting!  
Non-Glazing!  
Abuse Proof!**

**New WTTCo  
Diamond Impregnated  
WHEEL DRESSER**

Whole, natural diamonds of high quality and extreme toughness are spaced regularly throughout the matrix to give great accuracy, uniform dressings and to hold wheel to size. These stones are anchored permanently in their matrix by strong chemical bonds that will not break under heat, pressure or rough abuse. No remounting! Lowered costs! After tool is put in machine it will give best results if left in original position. It is not necessary to turn or alter the area in contact with the grinding wheel.

**Send for literature and prices.**

**WHEEL TRUEING TOOL CO., INC.**  
3200 W. Davison • Detroit

**In Canada: 575 Langlois, Windsor, Ont.**



**JUST WHAT THE DOCTOR ORDERED**

**R GRIFFIN Soft Center HACK SAW BLADES**

**HARD BACK . . . . .** to give the **stiffness** of all-hard blades.

**SOFT CENTER . . . . .** to give the **freedom** from **breakage** of flexible blades.

**VERY HARD TEETH .** to give the best of **wearing** and **cutting** qualities.

**GRIFFIN Soft Center Blades positively will not shatter. Write for further details.**

• GRIFFIN Blades available in high speed steel, special alloy, all-hard tungsten, and flexible tungsten.

*Manufactured by*  
**G. W. GRIFFIN CO.**  
FRANKLIN N. H.


*General Sales Agents*  
**JOHN H. GRAHAM & CO., INC.**  
105 DUANE ST. NEW YORK, N. Y.



**NEW**  
**Unbreakable**  
**OILERS**

TRICO OILERS maintain a constant level of oil in bearings. No guesswork, bearing failures, waste of oil or grease, oil-soaked motor windings, fire and accident hazards. A wonderful investment.

**Write for Bulletin #25**  
**TRICO FUSE MFG. CO.**  
Milwaukee Wisconsin



PRESSES  
FEEDS  
AUTOMATIC  
EQUIPMENT

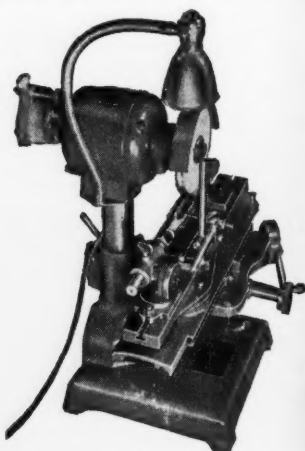
**THE V & O Press Co., Inc.**  
HUDSON, N. Y.

**SAVE 25%**  
**IN DRESSER**  
**COST!**

**CARBOLOY**  
**DIAMOND DRESSERS**  
**For Dressing All Grinding Wheels**

Write for Catalog DR-38  
**CARBOLOY COMPANY, INC.**  
11143 E. 8 Mile Road, Detroit, Mich.  
Chic. - Cleve. - Newark - Phila. - Pitts. - Worcester, Mass.

S. D. In the illustration herewith, the cutter grinder is shown grinding a large tap with the aid of a formed wheel.

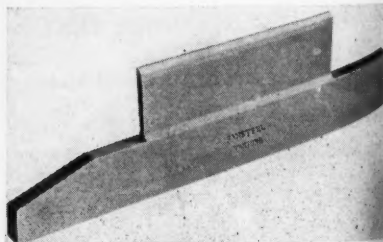


K. O. Lee Tap Grinding Equipment

A radial dresser is used for forming the wheel, and the tap is held between centers. For the grinding of small taps up to 1 in., a special attachment is supplied which holds the tap in a 3-in. universal chuck. In this case, the tap is fed into the wheel by means of a cam and is snapped back into position for grinding the relief on the next flute.

### Tantung-Faced Centerless Grinder Blades

Faced with a tough, slow-wearing alloy, centerless grinder rests for any type of machine or grinding operation are



Tantung-Faced Centerless Grinder Blade

# HERE'S A NEW "GUSHER"!



Flange mounted against pad on side of machine reservoir 3" x 5 1/2" pump inlet opens directly into reservoir providing unrestricted gravity flow. Pump discharges through outlet in center of this intake opening, making connection internally and confining piping to inside of machine housing. Equipped with 1/2 or 3/4 h.p. motor. Model 11020-A equipped with 1/4 h.p. motor. Supplies up to 85 G.P.M.

Pat. and Pats. Pend.

Ruthman Gushers are available in a wide range of sizes, types and capacities to meet any coolant requirement.

## RUTHMAN GUSHER COOLANT PUMPS

can be throttled down to a trickle with split-second control. Have high efficiency, fine balance, easy installation and outstanding simplicity. Send for detailed specifications.

**THE RUTHMAN MACHINERY CO.**  
538 E. FRONT ST., CINCINNATI, OHIO  
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

## PRODUCTO UTILITY PRESS

You can use it . . .

For shearing punches and dies in the tool room.

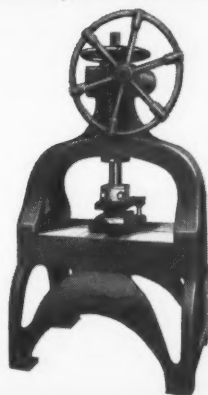
For separating punch and die holders on large liner pin die sets.

For assembling and aligning punches and dies.

As a powerful straightening press or arbor press.

For short broaching operations, pressing out pins from die sets, disassembling spindle or shafts from press fits in bearings.

**Write for complete details**



**THE PRODUCTO MACHINE CO.**  
BRIDGEPORT CONN.

now obtainable from Fansteel Metallurgical Corporation, North Chicago, Ill. The hard facing, Tantung, is a patented Fansteel alloy composed of hard particles of tantalum and tungsten carbide, uniformly distributed and firmly embedded in a strong, tough matrix. The presence of tantalum carbide in Tantung not only contributes to hardness, but also imparts a peculiar lubricating characteristic which improves resistance to wear. The alloy is said to withstand successfully the severe service of centerless grinding operations.

### STRAIGHT-CIRCULAR-IRREGULAR CUTTING OF SHEET METAL



BEVERLY cuts flat to any size or shape. Three sizes: No. 1, weighs 16½ lbs.; cuts up to 14 gauge. No. 2, weighs 32 lbs., cuts up to 10 gauge. No. 3, weighs 55 lbs., cuts up to 8 gauge.

Write for circulars and prices.

**BEVERLY**  
Throatless Shear Co.  
3004 W. 111th St.  
Chicago, Illinois

### YOU'LL SAVE TIME

AND TROUBLE... BY SPECIFYING NATIONAL TWIST DRILLS, HOBS, REAMERS... MILLING CUTTERS, Special TOOLS



**NATIONAL TWIST DRILL AND TOOL CO.**

DETROIT, U. S. A.

Top and Die Divisions, WINTER BROS. CO., Wrentham, Mass.  
Factory Branches: New York, Chicago, Philadelphia, Cleveland  
Distributors in Principal Cities

The Tantung facing, which is made in bar form, is firmly affixed to the steel supports by a special brazing process perfected in the Fansteel plant. Complete blades are manufactured to specification, Tantung facing is applied to existing blades furnished by users, or Tantung bars are obtainable for those equipped to do their own brazing. Worn-out blades can be reclaimed by application of Tantung facings, and when the Tantung facing itself finally wears out a new facing can be applied, thus giving grinder blades indefinite life.

### "Castolin" Welding Material

A welding material to be known as "Castolin" has been placed on the market by the Park Sales Co., 3 Park Pl., New York, N. Y. This material is available in a variety of alloys and fluxes for oxy-acetylene welding and, according to the manufacturer, enables welding operations to be performed at unusually low temperatures. Because of this feature, overheating and subsequent warping of welded parts are said to be avoided and stresses eliminated. Castolin alloys are supplied in rod form and Castolin fluxes in powder or paste form.

Castolin alloys for the steel, aluminum, brass, and bronze industries are now available, outstanding of which are Castolin 190 and 185. Castolin 190 is used for the welding of aluminum and its alloys and flows at a temperature of 930 deg. F. According to the manufacturer, this material has great tensile strength (35,000 lbs. per sq. in.) and durability, and is particularly useful in the aviation and automobile industries. Castolin 185, also known as "Bronzed" chrome, is used for building up on steel.

## "OUTWEARS

the best

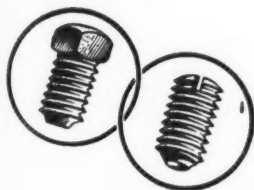
## Bronze Metal"

20 years ARGUTO without a drink—

**ARGUTO OILLESS BEARING CO.**

Wayne Junction, Philadelphia, Pa.

## MOORE'S



### SMALL SET SCREWS

Headless to 1/2-13—  
Square Heads to  
3/8-16 and Dardet

Our table, "Number of Linear Feet  
to Make 100 Pieces," sent on request.

**GEORGE W. MOORE**

44 Farnsworth St., Boston, Mass.

For 60 Years Mfgs. of Quality Screws

## KOEBELITE DIAMOND TOOLS



Deliver a Known  
Quantity—and Quality  
—of Service



**KOEBEL DIAMOND  
TOOL COMPANY**  
DETROIT

## CHICAGO MOUNTED WHEELS OF V/T SUPER BOND

### Greatest Forward Step in 30 Years

V/T Super Bond is one of the most important developments in mounted wheels. Nothing compares with it in long life, stamina and performance.

### 150% LONGER LIFE



Chicago Mounted Wheels of V/T Super Bond have 150% to 300% longer life, according to tests in many plants on snagging and exacting opera-

tions. Will not ridge on welds, sharp corners, sinking dies, barbering, etc. There's a shape and size to handle every grinding job faster, better, at lower cost. Let us send you a trial wheel. Tell us the kind of job, type of equipment used and size wheel you prefer.

### FREE MOUNTED WHEEL CHART—

Ideal for ready reference in the shop. A Wall Chart 22 x 15" showing actual size and shape of every standard Chicago Mounted Wheel.

### HANDEE Tool of 1001 Uses

A small "power house" that can be used wherever there is an electric outlet. Grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, cleans, etc. Uses 300 accessories. Weighs 12 oz., 25,000 r.p.m. \$18.50 post-paid with 6 Accessories.



10 Days Free Trial

Send for catalog of complete line.

**CHICAGO WHEEL & MFG. CO.**

Makers of Quality Products for 40 Years  
1101 W. Monroe St., Dept. MM, Chicago, Ill.

cast iron, copper, brass, bronze, and so on. This alloy flows poreless at 750 deg. F. and, though of a hardness of 230 Brinell, can be easily machined. It is said to be an ideal material for repairing broken or worn parts of machinery. Other alloys available which have binding temperatures as follows are: No. 15 for cast iron binds at 360 deg. F. Resistant to pressure at 8 atm. No. 16 for steel binds at 1,470 deg. F. Tensile strength, 115,000 lbs. per sq. in. Particularly recommended for thin gauge steel. No. 18 for copper, brass, extruded bronze, binds at 1,600 deg. F. and is

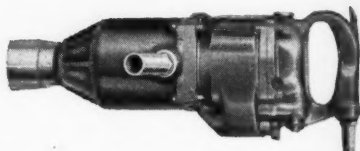
poreless. Tensile strength, 65,000 lbs. per sq. in.

No. 210 for cast aluminum binds at 950 deg. F. Tensile strength, 23,000 lbs. per sq. in. No. 195 for die casting (white metal) binds at 750 deg. F. High tensile strength.

Complete details are given in Pamphlet C-27, copy of which is free for the asking.

## CP Reversible "Power Vane" Wrenches

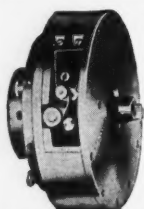
Two reversible "power vane" type wrenches, designated as the Nos. 365-R and 375-R, are announced by the Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. The CP 365-R Wrench



CP 365-R Reversible "Power Vane" Wrench

can be used for either applying or removing nuts up to and including  $1\frac{1}{4}$ -in. bolt size, such as dome, smoke box, cylinder and valve chamber head and front-end nuts. The wrench has a tapered nose end and employs a slow speed rotary motor of simple and efficient design. It has no gears or resilient member in the driving unit and is said to be extremely easy to operate. The 365-R wrench has a length of  $16\frac{1}{2}$  in. overall and weighs 27 $\frac{1}{2}$  lbs. A closed

### M-D Facing Heads With Automatic Feed



Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically and covers faces 6" to 30".

*Write for circular.*

**MUMMERT-DIXON CO.**  
120 PHILADELPHIA ST., HANOVER, PA.

## CENTERLESS GRINDING

*Accuracy—Prompt Service*

**Commercial Centerless Grinding Co.**

6603 Cedar Avenue, Cleveland

## SMALL SELF-LOCKING DRIVE PINS



Improve your assembly and cut your costs in half by replacing small taper pins, straight or cotter pins, keys and rivets with this new fastening pin. Use straight drilled holes, no tapping or reaming. Diameters  $1/32$ " to  $1/8$ ". Length up to  $1\frac{1}{4}$ ".

*Ask for circular and samples.*

**THE DRIV-LOK CO., INC.**

1525 RAILROAD AVE.

BRIDGEPORT, CONN.



lbs. per  
binds at  
3,000 lbs.  
casting  
F. High  
in Pam-  
e for the  
Vane"

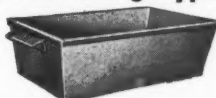
# **Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS**



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. Inexpensive — Last for years.

Write for Circular  
**NIELSEN TOOL &  
DIE COMPANY**  
1863 Gardner Ave.  
Berkley, Mich.

# **New Nesting Type Tote Pans**



**Lots of 50  
\$1.00 each**

20" long x 12" wide x 6½" deep.  
16 ga., drag holes and handles both ends.

Lots of 100 & 200 less 3%; 300 up less 5%

**J. L. LUCAS & SON, INC.**  
1 Fox Street Bridgeport, Conn.

" type  
os. 365-R  
the Chi-  
44th St.  
Wrench



**NICHOLSON EXPANDING MANDRELS**—for holding any job with bores from ¼" to 7" while being machined on lathes, grinders, or millers. Fourteen sizes—great time savers.

**OTHER PRODUCTS:** Steam Traps, Chromium Plated Steel and Stainless Steel Floats, Compressed Air Traps, Flexible Couplings, Steam and Air Separators.

**CONTROL VALVES,**  
flat disc type—  
for operating sin-  
gle and double act-  
ing air, steam,  
water or oil cylin-  
ders. ¼" to 1½"  
size.



**W.H. NICHOLSON & CO.**  
136 Oregon St. Wilkes-Barre, Pa.

Wrench

g or re-  
ing 1¼-in.  
box, cyl-  
head and  
has a ta-  
a slow  
and effi-  
or resili-  
it and is  
rate. The  
16¼ in.  
A closed

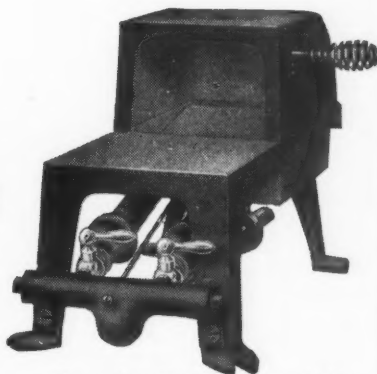
**You get--**  
**Power**  
**Efficiency**  
**Economy**  
**with the Johnson No. 101**

The Johnson No. 101 is the most powerful, efficient and economical bench furnace made for heating soldering coppers up to 12 pounds per pair, heat treating, tempering, annealing or case hardening any carbon steel tools or small metal parts. Equipped with work rest block, baffle plate, shut off valve, pilot light, and JOHNSON PATENTED CURVED SHAPED HOOD.

**No Blower Required**

**JOHNSON GAS APPLIANCE CO.**  
Cedar Rapids IOWA

527 E Ave. N.W. Established 1901



Clip and mail this coupon today

Please send me  
☐ More information on the No. 101  
Bench Furnace,  
☐ New Johnson Catalog.  
Name.....  
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City.....

SHAFT  
BLY  
COTTER PIN  
ASSEMBLY

handle with outside trigger and a hexagon socket for nuts  $1\frac{1}{2}$  in. across flats are furnished as standard equipment.

The CP 375-R Reversible Pneumatic Wrench, like the No. 365-R Wrench, employs a slow speed rotary motor and has no gears or resilient member in the driving unit. It is provided with a long, tapered nose end, has a length of  $21\frac{1}{4}$  in. overall, and weighs 61 lbs. This wrench can be used for either applying or removing nuts up to and including  $1\frac{3}{4}$ -in. bolt size and is particularly useful in refineries and railroad shops.



**PRECISION Years**

$\frac{5}{8}$ " to 16"

ANY MATERIAL

30 YEARS EXPERIENCE

**DETROIT BEVEL GEAR CO.**

8130 Jos. Campau Ave., Detroit, Michigan

**PYRO** THE SIMPLIFIED OPTICAL PYROMETER



Unique construction enables operator to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

**THE PYROMETER INSTRUMENT CO.**

Write for Bulletin No. 80 101-105 Lafayette St., N. Y.

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TRADE MARK

Over 4,000 Shapes, Cuts and Sizes

American and Swiss Patterns



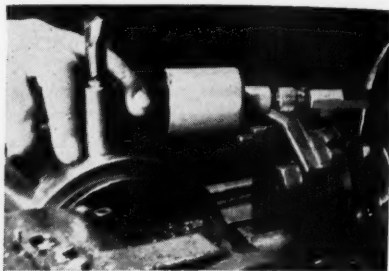
Write for NEW CATALOG—Just Off the Press.

**CARSON-NEWTON CO.**

61-71 MILL ST. • BELLVILLE, N. J.

## H & H Multi-Purpose Tool With Diamond Lap Hone

A multi-purpose tool available with either  $\frac{7}{8}$  or  $\frac{1}{2}$ -in. reciprocating stroke and equipped with a diamond-lap hone has been brought out by the H & H



H & H Multi-Purpose Tool With Diamond-Lap Being Used to "Touch-Up" the Cutting Tool of an Automatic Screw Machine

Research Co., 1925 Buena Vista, Detroit, Mich., for particular use in "touching-up" carbide tipped tools while set up for turning. The illustration shows the multi-purpose tool with diamond-lap being used to touch-up the cutting tool of an automatic screw machine without disturbing the setup.

The short reciprocating stroke of the H & H Multi-Purpose Tool makes it particularly adapted to removing the last thousandths of an inch in die sinking, pattern, tool, and plastic mold making, and in various other delicate operations. Power is provided by means of a 110-volt universal motor which develops a 6 to 12-lb. push at the head of the tool, consequently making the tool adaptable for filing, burring, honing

chips, and sawing. The diamond-lap is available in any grit from rough-cut to 500 grit, set  $\frac{1}{8}$  or  $\frac{1}{16}$  in. thick and 1 in. long on the face.

## G-E Weld Recorder

A weld recorder designed to record and indicate variables affecting the quality of spot welds on structural members of aircraft, rail cars, automobiles, buses, trucks, and so on, has been developed by the General Electric Co., Schenectady, N. Y. The weld recorder acts as a recording instrument, signaling device, and lockout control for measuring the electrical input to the spot-welding machine for each spot weld. It is so constructed that when the electrical input to the welder ( $I^2t$ ) varies sufficiently to cause a defective weld, a bell gives a continuous audible signal, and the weld-initiating circuit is automatically opened, thereby preventing subsequent welding until a push button is pressed. In addition, the recorder chart indicates visually whether the weld is within the preset allowable limits for proper welding and whether the heat is above or below normal.

## Pollard Stacking Box with Reinforced Corners

The Pollard Stacking Box shown herewith, product of the Pollard Bros. Mfg. Co., 5514 Northwest Highway, Chicago, Ill., is now available with improved type



Pollard Stacking Box with Reinforced Corners

reinforced corners which are said to remain tightly fitted together even under severe use. The construction of the reinforced corners is clearly shown in the drawing. With the use of reinforced corners of this type, the necessity of spot welding angle pieces in the cor-

## Loosen HEAT-FAG'S Grip on Your Plant

**PROVIDE** salt tablets freely to all workers who sweat. Doctors know that salt sweated out by heat and heavy work must be replaced, or workers tire quickly, and are less efficient. Hundreds of great industries have found salt tablets the simple, inexpensive way to replace salt loss and check Heat Fag . . . Write for folder: "Heat Fag Among Workers."

**MORTON'S  
SALT TABLETS**

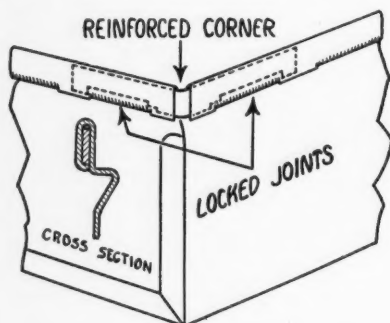


**Morton's Modern Sanitary Dispenser** Delivers tablets one at a time. Morton's Salt Tablets are made of the most highly refined salt, pressed into convenient tablet form. Easy to take with a drink of water — dissolves in less than 50 seconds after swallowing.

**ORDER NOW . . .** Dispenser \$4.50  
Case of 9000 10-grain salt tablets \$2.60  
Shipped Prepaid

**MORTON SALT COMPANY CHICAGO, ILLINOIS**

ners of a box is claimed to be entirely eliminated, and it is claimed that boxes thus made will never loosen or come apart.

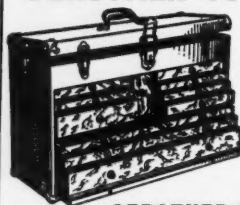


Drawing Illustrating Construction of Reinforced Corner

All sizes of Pollard stacking boxes, as well as open end boxes, can now be furnished with reinforced corners. A catalog showing Pollard stacking boxes is now ready.

## GERSTNER Tool Chests

**For Economy.**



Machinists and Toolmakers Save Money by saving tools from loss and damage. Gerstner Chests give the utmost protection at lowest cost.

*Free Catalog.*

**GERSTNER TOOL CHESTS**

1240 COLUMBIA ST.

DAYTON, OHIO

## Union Metal Skid Platform

An all-steel lift truck platform with corrugations has been placed on the market by The Union Metal Manufacturing Co., Canton, Ohio. This type of platform is available in variations, and includes a complete line of steel corrugated platform boxes.

The construction of the platform corrugation consists of two half-round recesses joined by a raised center rib. Both recesses and raised rib traverse the entire deck of the platform, rolling over the knee in a gradual curve and down the legs. It is stated by the manufacturer that this type of construction gives unusual strength.

## Cunningham Light Bevel Safety Steel Stamps

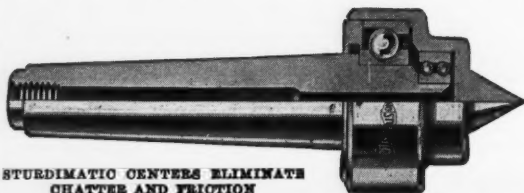
M. E. Cunningham Company, 115 E. Carson St., Pittsburgh, Pa., is now marketing light bevel safety steel stamps



Cunningham Light Bevel Safety Steel Stamps

which are not only designed to prevent accidents from spalling and mushroom-

## IT TURNS WITH THE WORK . . . .



STURDIMATIC CENTERS ELIMINATE CHATTER AND FRICTION

8 years continuous use has proved its value.

Sturdy radial and thrust bearings insure rigidity and load capacity.

Write for catalog and free trial offer:

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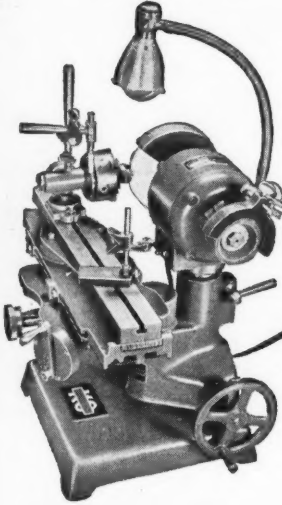


**SAVE YOUR FLOORS**  
**RE-WHEEL YOUR**  
**TRUCKS WITH**  
**END-WOOD**  
**WHEELS**  
*Easy Rolling*  
*Long Wearing*  
Sizes for all trucks.  
Casters for all  
purposes.  
Full Information **FREE**  
**METZGAR CO.**  
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*Hyatt Roller Bearing  
Heavy Duty*

**KNOCK-OUT** Reamer and Cutter  
**Grinder**

Here is one machine that is still  
within the range of your pocket book.



*Grinding a Hollow Mill Cutter*

**A machine in a class by itself.**

With this Universal Tool you can do any  
tool grinding job within its range, includ-  
ing Carbide tools, at a big saving in time.

Ask for bulletin No. RG394M.

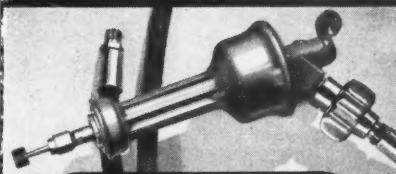
**K. O. LEE & SON CO.**

Aberdeen, So. Dak.

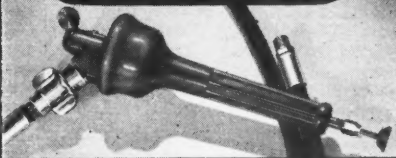
"practical tools for practical men"



**CUT COSTS-SAVE TIME**  
**TRY THESE SENSATIONAL**  
**KIPP<sup>air</sup>GRINDERS**



**THE PROOF—**  
**10 DAY FREE TRIAL**



This FREE trial offer permits any concern with  
a satisfactory credit rating to try out any Kipp  
Air Tool for ten days. Grinders sell from \$9.75  
to \$58.75, Chippers and Filers at \$19.75. The  
BB Grinder shown at top is only \$25; the AG  
Grinder, lower view, is \$19.75. Kipp Air Tools  
give you highest speeds, lowest prices and are  
proving indispensable in tool rooms and produc-  
tion departments. New catalog gives details.

**FREE!**  
**TEN-DAY**  
**TRIAL**



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**AIR TOOL**  
**CATALOG**

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☐ Send the New Kipp Air Tool Catalog!

Name -----

Company -----

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**MADISON-KIPP CORPORATION**

208 WAUBESA ST., MADISON, WIS., U. S. A.

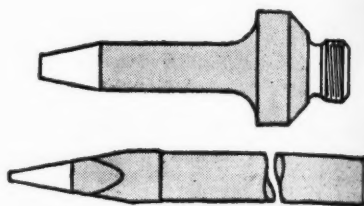
ing, but due to the alloy steel used are said to have the strength of ordinary heavy bevel steel stamps while being unusually light.

The light weight features makes the light bevel safety steel stamp easy to handle and is said to afford the maximum of accuracy in use. Because of the non-mushrooming and non-spalling features, it is not necessary to take the stamps out of production in order to have the heads redressed. The patented steel used in these stamps provides assured protection against bending and breaking.

## Stanley Armor-Clad Soldering Iron Tip

An armor-clad copper soldering tip for use on Stanley Screw Tip and Plug Tip Electric Soldering Irons has been announced by the Stanley Tools Division of The Stanley Works, 137 Elm St., New Britain, Conn. The armor-clad tip is covered with a special metal coating designed to protect the high conductivity copper core. The coating is also said

to protect the tip from corrosion and to prevent the copper from becoming worn. According to the manufacturer, the armor-clad tip can be readily tinned without filing and will retain its original



Stanley Armor Clad Soldering Iron Tip

nal shape without amalgamation with solder or oxidation.

The Stanley Armor-Clad Soldering Iron Tip has been found ideal for use in production work as well as in industrial training schools, service shops, industrial shops, and so on, and is available in a wide variety of sizes and shapes.

## New Literature

"Drill Holes 0.002 In. in Diameter Economically" is the title of a four-page bulletin describing features of the Taylor "Hi-Eff" Drill Press which are said to effect such savings as longer drill life, fewer scrap losses, faster hole drilling, a minimum of power consumption, and so on. Issued by the Taylor Sales Co., 2333 W. Clybourn St., Milwaukee, Wis., Bulletin 752 also discusses the Taylor "Hi-Eff" Universal Dividing Head and its use with the "Hi-Eff" Drill Press. Free to shop executives.

## NEW UNIVERSAL INDICATOR SHOCKPROOF

Scale readable in any position. Entire mechanism shockproof. Has had 12 years of actual shop test. Ideal for jig boring, milling, etc.

Write for new low prices, details.

**OSLUND TOOL & DIE COMPANY**  
14 Sigourney St., Hartford, Connecticut



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**ROTARY FILES**  
Ground from the Solid



**GROBET FILE CORP. of AMERICA**

*Write  
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The most complete catalog of its kind, illustrating hundreds of rotary files hand cut, milled cut, ground from the solid; also die-sinkers' burs.

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**Bond Flexible Insulated Couplings.** Five different types of Bond flexible insulated couplings are illustrated and described in a 12-page booklet, designated as the LF-16, now being issued by the Charles Bond Co., 617 Arch St., Philadelphia, Pa. The types discussed are Bondtru, Bondflex, Grundy, Bondit, and Mather. Copy free upon request.

**"Ketos" Oil Hardening Tool Steel Folder.** A six-page illustrated folder regarding "Ketos" oil hardening tool steel which is recommended for use in making blanking, trimming, and forming dies, gages, taps, master tools, and so on, has been prepared for distribution by the Crucible Steel Co. of America, 406 Lexington Ave., New York, N. Y. Included in the folder are general instructions for forging, annealing, hardening, and tempering "Ketos" tool steel. Copy free upon request.

**Fostoria "Para-Sphere" Reflector Folder PS-5.** A six-page folder describing Fostoria "Para-Sphere" reflectors for

infra-red lamps has been released by The Fostoria Pressed Steel Corp., Fostoria, Ohio. Designated as the PS-5, the folder outlines the advantages of infra-red equipment and gives complete specifications of the various types of Fostoria infra-red reflectors. Copy free upon request.

**"Red Ring Method of Burring Gear Teeth"** is the title of a four-page illustrated bulletin describing the Red Ring Gear Tooth Burring Machine, product of the National Broach & Machine Co., Shoemaker and St. Jean Sts., Detroit, Mich. Copy free upon request.

**Shaw-Box "Load Lifter" Electric Hoists Catalog No. 337-A.** Released by the Shaw-Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., 440 Broadway, Muskegon, Mich., this 24-page catalog presents by means of description and illustrations the features, advantages, and uses of the Shaw-Box "Load Lifter" Electric Hoist. Complete specifications are listed. Copy free upon request.



Want a book showing  
**OVER 5000**  
**DIFFERENT FILES?**  
*by Grobet*

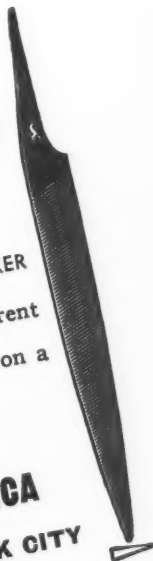
THE "ORIGINAL" SWISS FILE MAKER

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss files. Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

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**3 PARK PLACE**  
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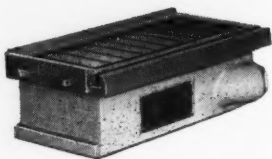
**Curtis Hydraulic Lifting Cylinders**, applicable in a wide range of industries to raising or lowering materials to different levels quickly and accurately, is the subject of Bulletin B-8 now being distributed by the Curtis Pneumatic Machinery Co., St. Louis, Mo. Copy free upon request.

"Cut Your 'Cutting-Off' Cost" is the title of a four-page bulletin describing how the "1600" Series Delta Abrasive Cut-Off Machine, product of the Delta

Mfg. Co., 634 E. Vienna Ave., Milwaukee, Wis., is designed to reduce production costs and ensure accuracy in cutting materials such as steel, brass, copper, cast iron, monel metal, bakelite and all plastic materials, pipe, wire rope, stellite, tool steel, manganese steel, brake linings, tile, brick, carbon, porcelain, slate, hard rubber, and so on. Copy free upon request.

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TO HOLD AND DEMAGNETIZE  
WORK ON ONE UNIT WITHOUT  
A SEPARATE DEMAGNETIZER



GUARANTEED TO GIVE EFFICIENT  
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MANUFACTURED BY THE MAKERS OF  
KAR TIME-SAVING ACCESSORIES

Est. 1916

THE KAR ENGINEERING CO., INC.  
200 Hudson Street New York City

**Knight Millers.** A brochure illustrating and describing the various types of milling machines manufactured by the W. B. Knight Machinery Co., St. Louis, Mo., has been prepared for distribution by this firm. Complete specifications for each type of miller are given.

The brochure also contains several pages illustrating and describing Knight horizontal milling attachments, shaping attachments, worm driven circular tables, steel body vises, swivel base vises, and index cutters. Copy free upon request.

**Kennametal Chip Breaker Chart.** A handy wall chart illustrating a practical type of chip breaker design for Kennametal steel-cutting carbide tools has been prepared by the McKenna Metals Co., 300 Lloyd Ave., Latrobe, Pa. This practical type of design, which is a shallow groove only 0.004 to 0.008 in. deep, tends to convert steel chips into short, coiled pieces which can be easily shoveled up. The reverse side of the chart shows how this shallow groove may be ground by hand on a silicon carbide or diamond impregnated wheel.

Like previous Kennametal instruction charts, the chip breaker chart has a hole punched at the top so that it can easily be hung on the wall or the lathe. Chart free upon request.



Write  
for  
Literature

## ELIMINATE SET-UP TIME!

*Increase Production*

USE KARNETICS ON YOUR MAGNETIC CHUCK FOR  
GRINDING IRREGULAR SHAPES AS EASILY AS FLAT  
SHAPED PIECES . . . LARGE QUANTITIES CAN BE  
INSTANTLY SET AND GROUND IN ONE OPERATION

Est. 1916

THE KAR ENGINEERING CO., Inc. 200 Hudson St. New York City

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**Red Ring L.C.B. and L.C.H. Lapping Compounds.** A four-page folder regarding Red Ring L.C.B. oil soluble and L.C.H. water soluble lapping compounds has been prepared for distribution by the National Broach & Machine Co., Shoemaker and St. Jean Sts., Detroit, Mich. Copy free upon request.

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**"In Step With Modern Progress"** is the title of a 16-page illustrated folder now being distributed by Bay State Abrasive Products Co., Westboro, Mass., describing the features, advantages, and uses of Bay State Resinoid Bonded Wheels. Copy free upon request.

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**Corey Straightener.** This four-page folder issued by The McWilliams Mfg. Co., 237 Eddy St., Providence, R. I., illustrates and describes the Corey Straighteners Nos. 1 and 2 for use in straightening or bending very fine work and for straightening or bending stock, shafting, drills, reamers, drive shafts, spindles, arbors, broaches, and so on, respectively. Copy free upon request.

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**Porter-Cable Equipment Folder.** Porter-Cable "Take-About" Electric Sanders, "Speedmatic" Hand Saws and Floor Sanders, and Belt, Disc, and Spindle Sanders are presented in a 12-page folder released by the Porter-Cable Machine Co., 300 Wolf St., Syracuse, N. Y. Copy free upon request.

**"Chicago" Leather Belting Catalog.** The Chicago Belting Co., 113 N. Green St., Chicago, Ill., is now issuing a 24-page catalog on tension welded leather belting. Profusely illustrated, the catalog describes the features, advantages, and uses of Chicago tension welded leather belts and how practically every inch of leather that goes into them is tested before it is made into belts. The latter part of the catalog is devoted to a discussion of Chicago belt oils, round leather belting, belt lacing, leather belt cements, textile leathers, hydraulic packings, and mechanical leather specialties.

Copy of catalog will be sent free of charge to any mechanical executive who will address a request on his company letterhead.



**SPEED  
WITH  
ACCURACY!**  
MEASURE EXACT ANGLES  
ONLY A TWO-INCH  
MICROMETER IS REQUIRED

*Write for Literature*  
The New and Improved  
**Sine Angle Plate**

**THE KAR ENGINEERING COMPANY, INC.**  
200 HUDSON STREET NEW YORK CITY

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1940

**Curtis Model "C" Air Compressors.** Complete information, including design details and data tables, on Curtis Two-Cylinder and Four Cylinder Model "C" Air Compressors is contained in a 10-page illustrated bulletin now being published by the Curtis Pneumatic Machinery Co., St. Louis, Mo. Copy of Bulletin C-4-C free upon request.

**Lee "Sciencetech" Spring Specification Form.** A four-page form on the physical specifications and operating conditions of the Lee-Built "Sciencetech" Spring is now being issued by the Lee Spring Co., Inc., Brooklyn, N. Y. Copy free upon request.

**Max-Well-Made Precision Tools.** An illustrated and descriptive circular on the various types of precision grinders marketed by the F. A. Maxwell Co., 380 Broadway, Bedford, Ohio, has been prepared by this firm. The Maxwell Mastur Precision Boring Head and E-Z Set Boring Tool are also illustrated in the circular, copy of which is available free upon request.

**Moore Precision Jig Borer** is the subject of a 16-page illustrated catalog now being distributed by Marburg Bros., Inc., 90 West St., New York, N. Y. This catalog discusses the ten distinctive features exclusive with the Moore Jig Borer as well as other important features of the unit. The various accessories available for use with the Moore Jig Borer are also illustrated and described. Specifications are listed. Copy free upon request.

**Bunting General Catalog No. 40.** This catalog reveals the addition of many new sizes to the list of standardized industrial bearings marketed by The Bunting Brass & Bronze Co., Toledo, Ohio. Many new numbers are also listed in the section devoted to electric motor bearings available from stock for all makes of electric motors. Complete listing of Bunting precision bronze tubular and solid bars, babbitt metals, and special products and services are contained in the catalog. General data of interest to manufacturers, engineers, purchasers, and shop men is also included. Copy of Catalog No. 40 free upon request.



Ball  
Bearing  
Electric  
Grinder

## Glizbe Grinders

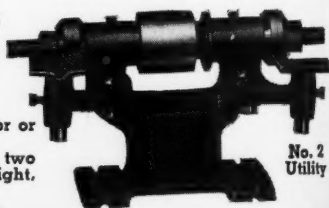
Electric and  
Belt Driven

Heavy, rigid grinders in floor or bench types. Grinder on left carries two wheels, 12" diameter. On right, 7" wheels.

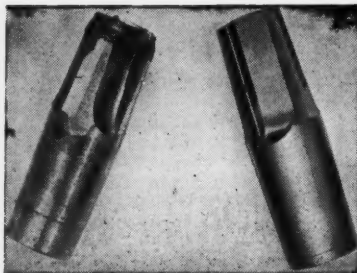
Write today for full details.

**GLIZBE BROS. MFG. CO.**

PLYMOUTH  
INDIANA



No. 2  
Utility



**DON'T THROW AWAY VALUABLE  
CARBIDE TIPPED TOOLS \$\$\$**

- Write at once for our folder on **CARBIDE TOOL SALVAGE.**

Tips Remounted — Shanks Retipped — Round  
Tools Expanded to Size — Grinding — Lapping

**Carbide Tool Salvage Division  
SUPER TOOL COMPANY**

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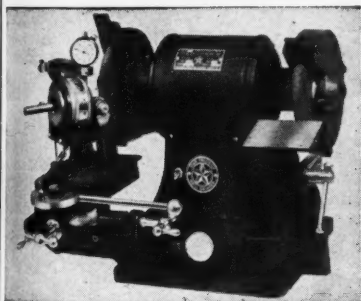
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"Workers Who Sweat Need Salt" is the title of an eight-page folder issued by Morton Salt Co., 208 W. Washington St., Chicago, Ill., discussing the use of Morton salt tablets to combat heat fatigue among workers in blast furnaces and steel mills, foundries, machine shops, large shops, automotive plants, stamping and enameling plants, textile mills, oil fields and refineries, structural iron work, electric light and power plants, and so on. Copy free upon request.

**Johnson Bronze Catalog 400.** The 1940 edition of the Johnson Bronze General Catalog, publication of the Johnson Bronze Co., 590 S. Mill St., New Castle, Pa., is now ready for distribution by this firm. Designated as the No. 400, the catalog lists and describes over 800 sizes of plain bearings and contains more than 300 listings of bronze bars. Many new numbers which have been added to the electric motor bearing section are illustrated. Other items such as graphited bronze, Ledaloyl self-lubricating bearings, and babbitt are also covered. Copy of Catalog 400 available to mechanical executives upon request.

## Trim Your Drill Costs with a **STAR PRECISION DRILL GRINDER**

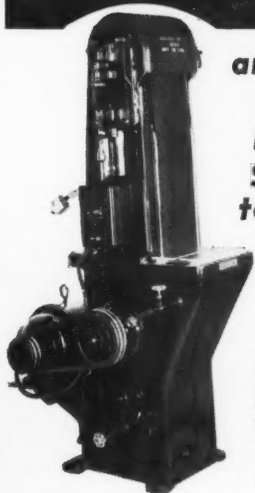


Produces perfect points on drills No. 41 to  $\frac{5}{8}$ " inc. Write for Descriptive Folder.

**Star Machine & Engineering Corp.**  
Division Star Electric Motor Co., Bloomfield, N.J.

*with*  
**PORTER-CABLE**  
*Belt*  
**Sander-Grinder**

**ONE OPERATION**  
*faces 12 bosses per side*



**and produces  
EXACT  
PARALLEL  
SURFACES  
to .005 inch!**

We believe PORTER-CABLE Belt Sander-Grinder can help you get better work at less cost because it has helped so many other manufacturers do just that. It's the modern way to do many finish operations. It frequently takes the place of wheel

grinding—in some cases makes milling machine work unnecessary.

Maybe some of your production operations can be done this time-saving, cost-cutting way. Without obligation, send sample castings, stampings, and plastic pieces TODAY, for our engineers' suggestions.

**PORTER-CABLE Machine Co.**  
300-D Wolf St. Syracuse, N. Y.

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# **Hotel KENMORE**

**IN  
BOSTON**

- All Rooms with tub and shower bath.
- Rates from . . . \$3.50.
- Ample parking space.
- Send for free historical map of Boston.



**L. E. WITNEY,**  
**Managing Director**

**Rock River Steel Fabricators.** Bulletin No. 49 covering the complete line of steel fabricating equipment manufactured by the Rock River Machine Division of Hannifin Mfg. Co., Janesville, Wis., for punching, shearing, notching, cutting-off, squaring, splitting, riveting, bending, forming, and straightening is now being published by this firm. Copy free upon request.

### **"March of the Masters"**

"March of the Masters," a 50-page, spiral bound book published by The R. K. LeBlond Machine Tool Co., Madison and Edwards Road, Cincinnati, Ohio, is now ready for distribution. This colorful book shows the important part the lathe has played in the development of many a great man and industry, and in addi-



tion, describes the LeBlond line of Regal and Super Regal Lathes.

The format of "March of the Masters" is designed in keeping with LeBlond's policy of humanizing its advertising literature. In addition to telling the story behind the lathe, it also presents the Super Regal lathes and accessories in an interesting, easy-to-read style. Airbrush drawings in three colors are used to illustrate "March of the Masters."

One entire section of the book is devoted to showing and describing some of the manufacturing processes used in the construction of LeBlond Regal and Super Regal Lathes.

A copy of the book may be obtained by addressing The R. K. LeBlond Machine Tool Co. at the above address.

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**"Landisize Your Threads."** Released by the Landis Machine Co., Inc., Waynesboro, Pa., this 16-page folder illustrates and describes Landis Thread Cutting Die Heads, Thread Cutting Machines, and Collapsible Taps which are designed to better serve 1940 threading requirements. Copy free upon request.

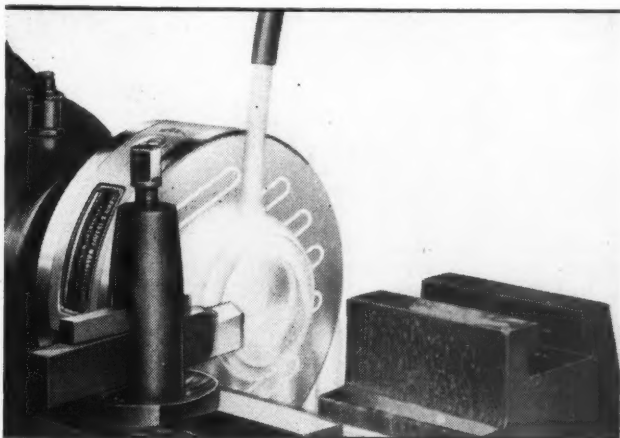
**Cincinnati All-Steel Shears** is the subject of an attractively printed and profusely illustrated 28-page catalog prepared for distribution by The Cincinnati Shaper Co., Cincinnati, Ohio. Copy of Catalog S-2 free to any mechanical executive upon request.

**Oilgear Surface Broaching Machine Bulletins 23001 and 24001.** The line of single and double slide vertical surface broaching machines marketed by The Oilgear Co., 1320A W. Bruce St., Milwaukee, Wis., is illustrated and described in 24 and 16-page bulletins respectively, published by this firm. The eleven standard machines listed in each bulletin feature a patented interlocked, automatic, shuttle mechanism, positively locked in broaching position; high speed harmonic shuttle table operation, variable broaching speed; simple push-button control; hardened and ground ways; pressure lubrication, and many other outstanding features. Over forty typical surface broaching machine installations are also illustrated and described in the bulletins, and complete specifications are listed. Copy of Bulletins 23001 and 24001 free upon request.

## Tool Steel for the Non-Metallurgist, II

(Continued from page 80)

with a type of steel which possesses characteristics that will most completely meet the requirements. Changing from one grade to another blindly may solve the problem, but the odds are against such a plan being successful.



## - in addition to Grinding . . . .

there are other profitable uses for

## BROWN & SHARPE ROTARY MAGNETIC CHUCKS

PERMANENT MAGNET TYPE

— Such as on lathes as shown. Write for circular on Rotary and Rectangular Models.



BROWN & SHARPE MFG. CO., PROVIDENCE, R. I., U. S. A.



# FOR YOUR CATALOG LIBRARY

*To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.*

1. **Surface Grinder**  
Bulletin M-644 features Builders "T" Surface Grinder for grinding tools, dies and small machine parts. Builders Iron Foundry, Providence, R. I.
2. **Radiation Pyrometer**  
Catalog No. 100 issued by The Pyrometer Instrument Co., 103-105 Lafayette St., New York, N. Y., features the PYRO Radiation Pyrometer.
3. **Balancing Machine**  
New 6-page bulletin issued by Taylor Sales Company, 2333 W. Clybourn St., Milwaukee, Wis., illustrates and describes the Taylor HI-EFF Static Universal Balancing Machine.
4. **Broaches and Fixtures**  
Detroit Broach Co., Inc., 6000 Beniteau Ave., Detroit, Mich., has issued a new 16-page booklet detailing Detroit broaches and broaching fixtures.
5. **Trouble Savers**  
Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee, Wis., has issued new folder titled "14 Big Trouble Savers." It contains complete specifications and illustrations of powder-packed renewable fuses, non-renewable fuses, plug fuses, thermal time-lag fuses, tamper-resisting plug fuses, clamps for locking fuse clips, heavy duty test clamps, fuse pullers and automatic lubricators for all types of bearing surfaces.
6. **Stainless Steel Machinability Slide Rule**  
A handy stainless steel "machinability" slide rule incorporating the condensed findings of intensive research on the machining of stainless steel has been produced by Rustless Iron & Steel Corp., 3400 E. Chase St., Baltimore, Md., for men and firms engaged in fabricating this metal.
7. **Speed Vise**  
New bulletin 21-S illustrates and describes the Greene Speed Vise in 3-in., 4-in. and 6-in. sizes. Cardinal Machine Co., Inc., Glendale, Cal.
8. **Handnib**  
The Handnib for quickly cutting sheet metal into desired shapes is illustrated and described in bulletin available from National Machine Tool Co., 1536 Clark St., Racine, Wis.
9. **Standardized Bearings**  
The Bunting 1940 Catalog lists many new sizes of Standardized Bearings and contains much valuable information. The Bunting Brass & Bronze Co., Toledo, Ohio.
10. **Shapers**  
New bulletin featuring 16-in., 20-in., 24-in. and 28-in. Hy-Draulic Shapers has been published by Rockford Machine Tool Co., Rockford, Illinois.
11. **Resinoid Bonded Wheels**  
New folder detailing Bay State Resinoid Bonded wheels has been issued by Bay State Abrasive Products Co., Westboro, Mass.
12. **Socket Screws**  
Bulletin 83-8P outlines the details on Bristol Socket Screws. The Bristol Co., Mill Supplies Div., Waterbury, Connecticut.
13. **Rotary Files**  
Rotary Files and Diesinkers' Burs are illustrated and described in Catalog KG available from Grobet File Corp. of America, 3 Park Place, New York, N. Y.

#### 14. Machine Tool Motor Drive

A complete line of transmissions for motorizing all types of machine tools is illustrated and described in bulletin released by Western Manufacturing Company, 3428 Scotten Ave., Detroit, Michigan.

#### 15. Milling Attachments

Fray All Angle Milling Attachments are illustrated and described in bulletin available from Fray Machine Tool Co., Glendale, California.

#### 16. Tool Cases and Chests

Fourteen types of tool cases and chests for tool makers and machinists are illustrated and described in bulletin available from H. Gerstner & Sons, 1240 Columbia St., Dayton, Ohio.

#### 17. Cut-Off Machine

New, improved Delta Cut-Off Machine is illustrated and described in new bulletin available from Delta Mfg. Co., 634 E. Vienna Ave., Milwaukee, Wisconsin.

#### 18. Punches, Shears, Bending Brakes

Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill., has available Catalog No. 13, outlining ball bearing punches, shears, angle iron machinery and bending brakes.

#### 19. Pipe Tools

Catalog 39, issued by The Toledo Pipe Threading Machine Co., Toledo, Ohio, details Toledo pipe and bolt threading devices, pipe cutters, ream-

ers, pipe vises, portable work benches, boring tool, power drives, and power pipe machines.

#### 20. Furnaces and Gas Burners

Johnson Gas Appliance Co., Cedar Rapids, Iowa, has issued a new catalog featuring the Johnson line of equipment including heat-treating and melting furnaces, urn burners, hand torches, etc.

#### 21. Stainless Steel Stock List

This is a handy 16-page Stocklist SS100 showing size of Resistal sheets, bars and welding rods carried in Crucible's Mills and Branches. Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y.

#### 22. Dust Control Systems

Bulletin No. 272, issued by American Air Filter Co., Inc., Louisville, Ky., illustrates and describes Roto-Clone Dust Control Systems.

#### 23. Internal Cutting Tools

Illustrations, details and prices on plain boring tools, facing and bottoming tools, and internal thread tools are contained in new bulletin just issued by Bokum Tool Co., 49 W. Hancock Ave., Detroit, Michigan.

#### 24. Universal Tool Holder

Descriptive circular and price list on Elk Universal Tool Holder for right and left hand facing, turning, threading, and also boring and cutting-off operations is available from Elk Tools Inc., 33-35 West 60th St., New York, N. Y.

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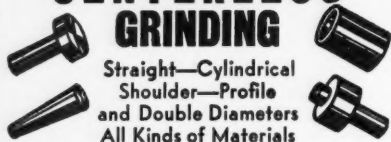
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## George S. May Business Foundation

Plans for the organization of a non-profit fact-finding organization to carry on research work in the interests of private business enterprise have been announced by George S. May of the George S. May Business Foundation, 111 S. Dearborn St., Chicago, Ill. The organization has been granted a non-profit Illinois charter and has opened offices in both Chicago and New York City. Research engineers will be maintained in 18 leading America cities.

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ings will be made available to business groups and educational institutions without charge.

## Meeting of National Metal Trades

The National Metal Trades Association has announced that the 42nd Annual Convention of the association is to be held at the Biltmore Hotel, New York City, on May 21st and 22nd. As usual, the subjects to be discussed will treat with industrial relations problems.

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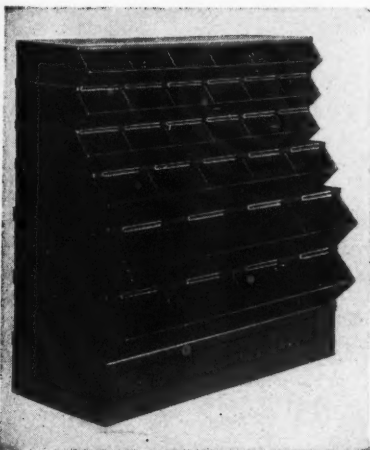
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such as the split type furnace rheostat controller, the potentiometer recorder for temperatures and time element recordings, and the quenching tank. A sample chart with record is shown for reference. Data regarding various types of tests and specimen or sample required are also given. Copy of Bulletin 546 free upon request.